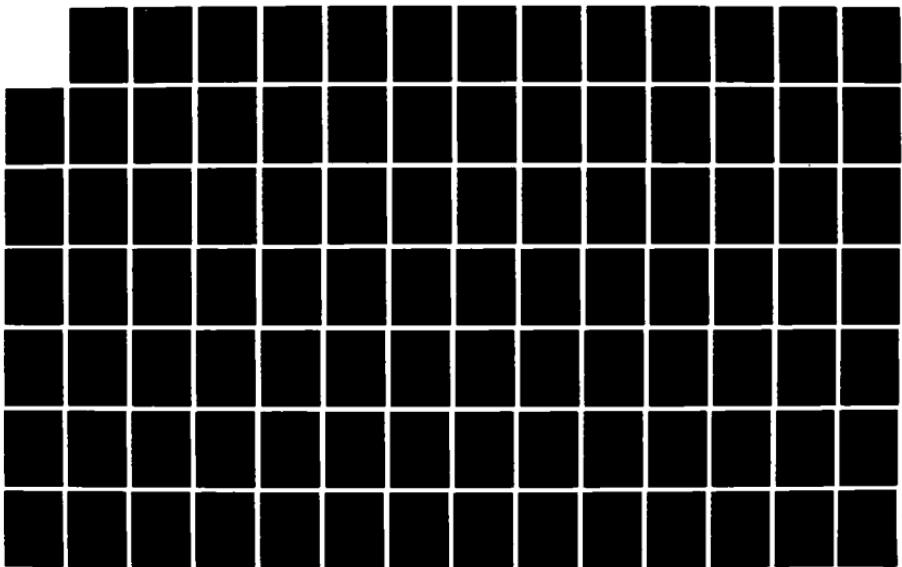
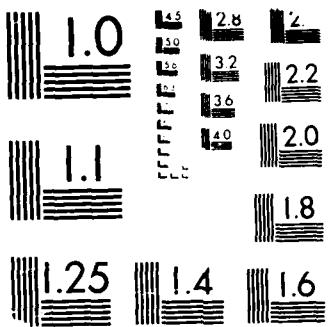


AD-A193 231 VERTICAL DIRECTIONALITY OF AMBIENT NOISE AT 32 DEG N AS 1/2
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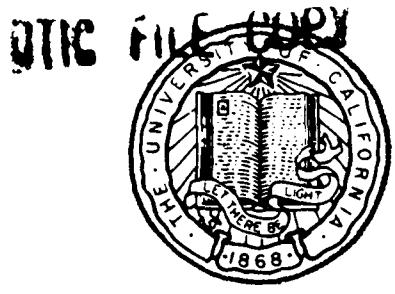
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MARINE PHYSICAL
LABORATORY
SCRIPPS INSTITUTION OF OCEANOGRAPHY

San Diego, California 92152

AD-A193 231

VERTICAL DIRECTIONALITY OF AMBIENT NOISE
AT 32° N AS A FUNCTION OF LONGITUDE:
Tape #85010

W. S. Hodgkiss and F. H. Fisher

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REF ID: A62512
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MPL TECHNICAL MEMORANDUM 387-B

MPL-U-32/86

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January 1988

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED		1b. RESTRICTIVE MARKINGS	
2a. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.	
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE			
4. PERFORMING ORGANIZATION REPORT NUMBER(S) MPL TECHNICAL MEMORANDUM 387-B [MPL-U-32/86]		5. MONITORING ORGANIZATION REPORT NUMBER(S)	
6a. NAME OF PERFORMING ORGANIZATION Marine Physical Laboratory	6b. OFFICE SYMBOL (If applicable) MPL	7a. NAME OF MONITORING ORGANIZATION Office of Naval Research Department of the Navy	
6c. ADDRESS (City, State, and ZIP Code) University of California, San Diego Scripps Institution of Oceanography San Diego, CA 92152		7b. ADDRESS (City, State, and ZIP Code) 800 North Quincy Street Arlington, VA 22217-5000	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Office of Naval Research	8b. OFFICE SYMBOL (If applicable) ONR	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N00014-84-K-0097 and N00014-87-C-0127	
8c. ADDRESS (City, State, and ZIP Code) Department of the Navy 800 North Quincy Street Arlington, VA 22217-5000		10. SOURCE OF FUNDING NUMBERS	
		PROGRAM ELEMENT NO.	PROJECT NO.
		TASK NO.	WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) Vertical Directionality of Ambient Noise at 32°N as a Function of Longitude: Tape #85010			
12. PERSONAL AUTHOR(S) W.S. Hodgkiss and F. H. Fisher			
13a. TYPE OF REPORT tech memo	13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day) January 1988	15. PAGE COUNT 129
16. SUPPLEMENTARY NOTATION			
17. COSATI CODES		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) ambient noise, vertical arrays, vertical directionality, NORDA VEKA 48-element vertical array	
19. ABSTRACT (Continue on reverse if necessary and identify by block number) <p>Measurements have been made of the ambient noise field between 25 and 300 Hz with vertical arrays at 32°N (124°W, 136°W, and 150°W). This technical report contains the complete analysis results for the NORDA VEKA 48-element vertical array Tape #85010. The tape was recorded at 32°N, 124°W (approximately 350 nmi due west of San Diego) on 18 October 1985 beginning at 20:05 PDT. At that time, the wind speed was 6 kts.</p>			
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input type="checkbox"/> UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS		21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
22a. NAME OF RESPONSIBLE INDIVIDUAL W. S. Hodgkiss		22b. TELEPHONE (Include Area Code) 619-534-1798	22c. OFFICE SYMBOL MPL

Vertical Directionality of Ambient Noise

at 32° N as a Function of Longitude:

Tape #85010

W.S. Hodgkiss and F.H. Fisher

Marine Physical Laboratory
Scripps Institution of Oceanography
San Diego, CA 92152

Abstract

Measurements have been made of the ambient noise field between 25 and 300 Hz with vertical arrays at 32° N (124° W, 136° W, and 150° W). This technical report contains the complete analysis results for the NORDA VEKA 48-element vertical array Tape #85010. The tape was recorded at 32° N, 124° W (approximately 350 nmi due west of San Diego) on 18 October 1985 beginning at 20:05 PDT. At that time, the wind speed was 6 kts.

I. Introduction

This technical report contains the complete analysis results for the NORDA VEKA 48-element vertical array Tape #85010. The tape was recorded at 32°N, 124°W (approximately 350 nmi due west of San Diego) on 18 October 1985 beginning at 20:05 PDT. At that time, the wind speed was 6 kts.

A complete description of the experiment and data analysis procedure is given in the summary technical report (TM-387-A). Here, a brief guide will be provided to the results documented in the the various sections.

Section II (Preliminary Analysis) provides a preliminary look at the data quality from 4 hydrophones spaced approximately equally across the array for the first data segment (65536 points).

The results are ordered as follows:

- (1) Channel means (A/D counts).
- (2) Time series (A/D counts) for the first 1024 points of the first segment.
- (3) Time-varying mean (A/D counts, 64-point averages).
- (4) Time-varying power (A/D counts squared, 64-point averages) (channel means have been removed).
- (5) Power spectra (dB// μ Pa/ $\sqrt{\text{Hz}}$) (channel means have been removed).

Section III (Power Spectra) provides an extended preliminary look at the power spectra from all hydrophones in the array for the first data segment (65536 points). The results are ordered as follows:

- (1) Channel means (A/D counts).
- (2) Power spectra (dB// μ Pa/ $\sqrt{\text{Hz}}$) (channel means have been removed).

Section IV (Array Response: Waterfall, KB Window) provides waterfall plots of the time-evolving vertical directionality of ambient noise for successive segments (65536 points) across the entire data tape (dB// μ Pa/ $\sqrt{\text{Hz}}\text{Deg}$). A Kaiser-Bessel window ($\alpha = 1.5$) was used to amplitude shade the array elements.

Section V (Array Response: Waterfall, Rect Window) provides waterfall plots of the time-evolving

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vertical directionality of ambient noise for successive segments (65536 points) across the entire data tape (dB// μ Pa/ $\sqrt{\text{Hz}}\text{Deg}$). A rectangular window was used to amplitude shade the array elements.

Section VI (Array Response: Panels, KB Window) provides multi-panel plots of the time-evolving vertical directionality of ambient noise for successive segments (65536 points) across the entire data tape (dB// μ Pa/ $\sqrt{\text{Hz}}\text{Deg}$). A Kaiser-Bessel window ($\alpha = 1.5$) was used to amplitude shade the array elements.

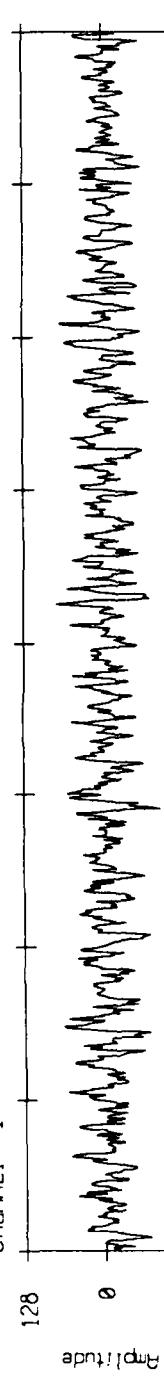
Section VII (Array Response: Panels, Rect Window) provides multi-panel plots of the time-evolving vertical directionality of ambient noise for successive segments (65536 points) across the entire data tape (dB// μ Pa/ $\sqrt{\text{Hz}}\text{Deg}$). A rectangular window was used to amplitude shade the array elements.

II. Preliminary Analysis.

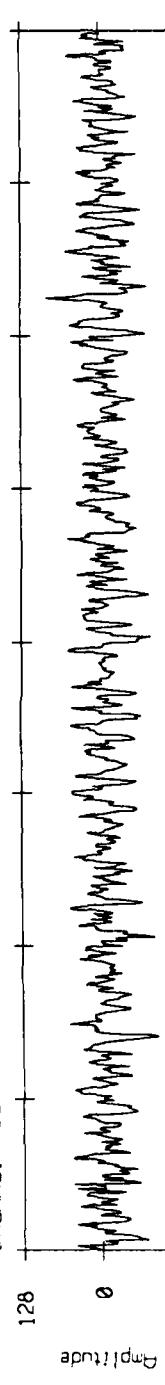
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1 5.4024505615234

Time Series - 85010.1

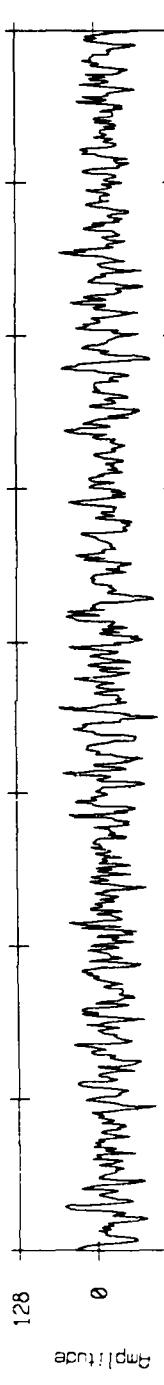
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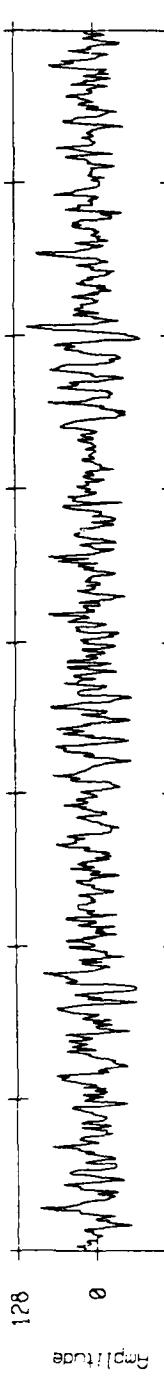
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Channel #32

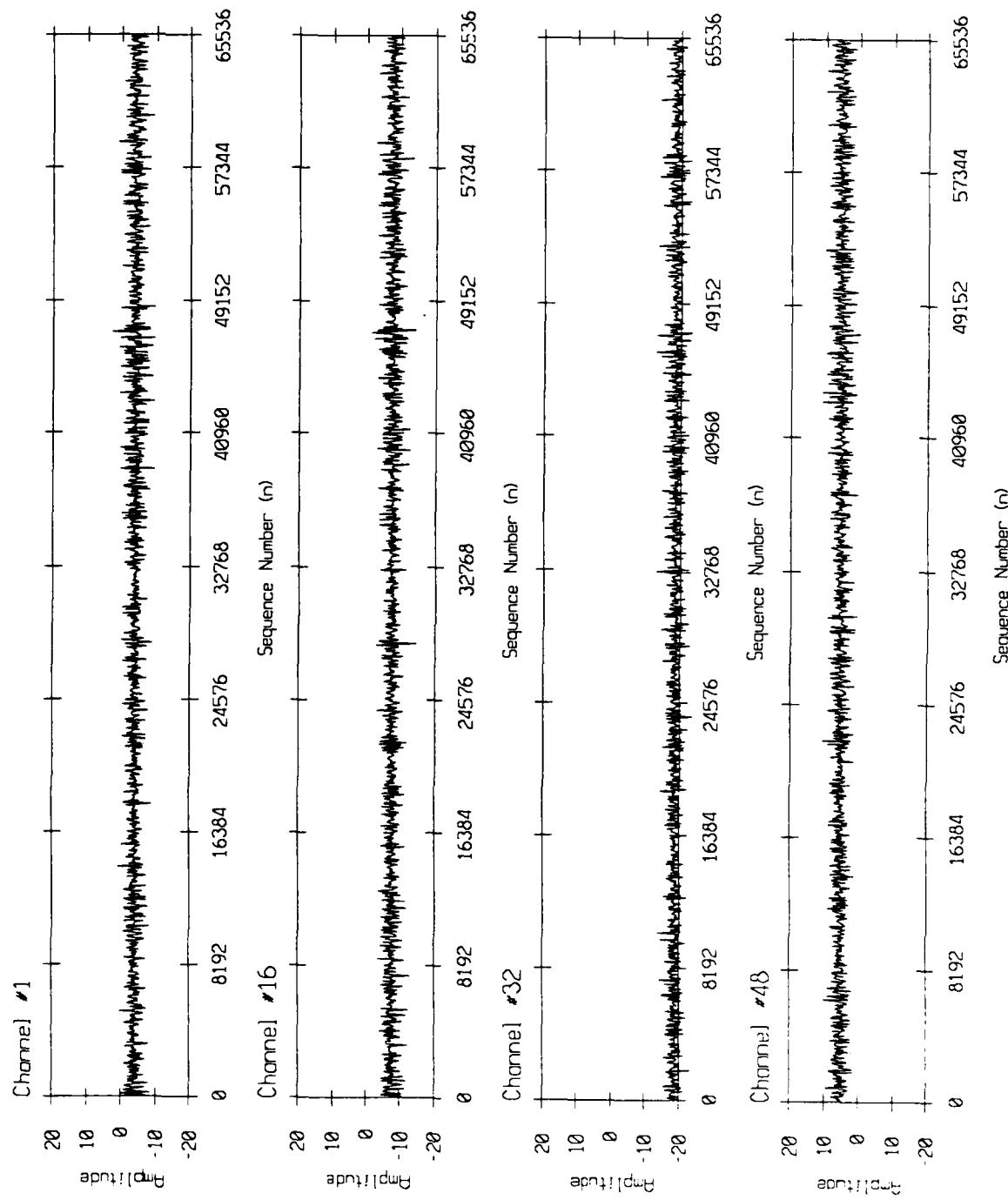


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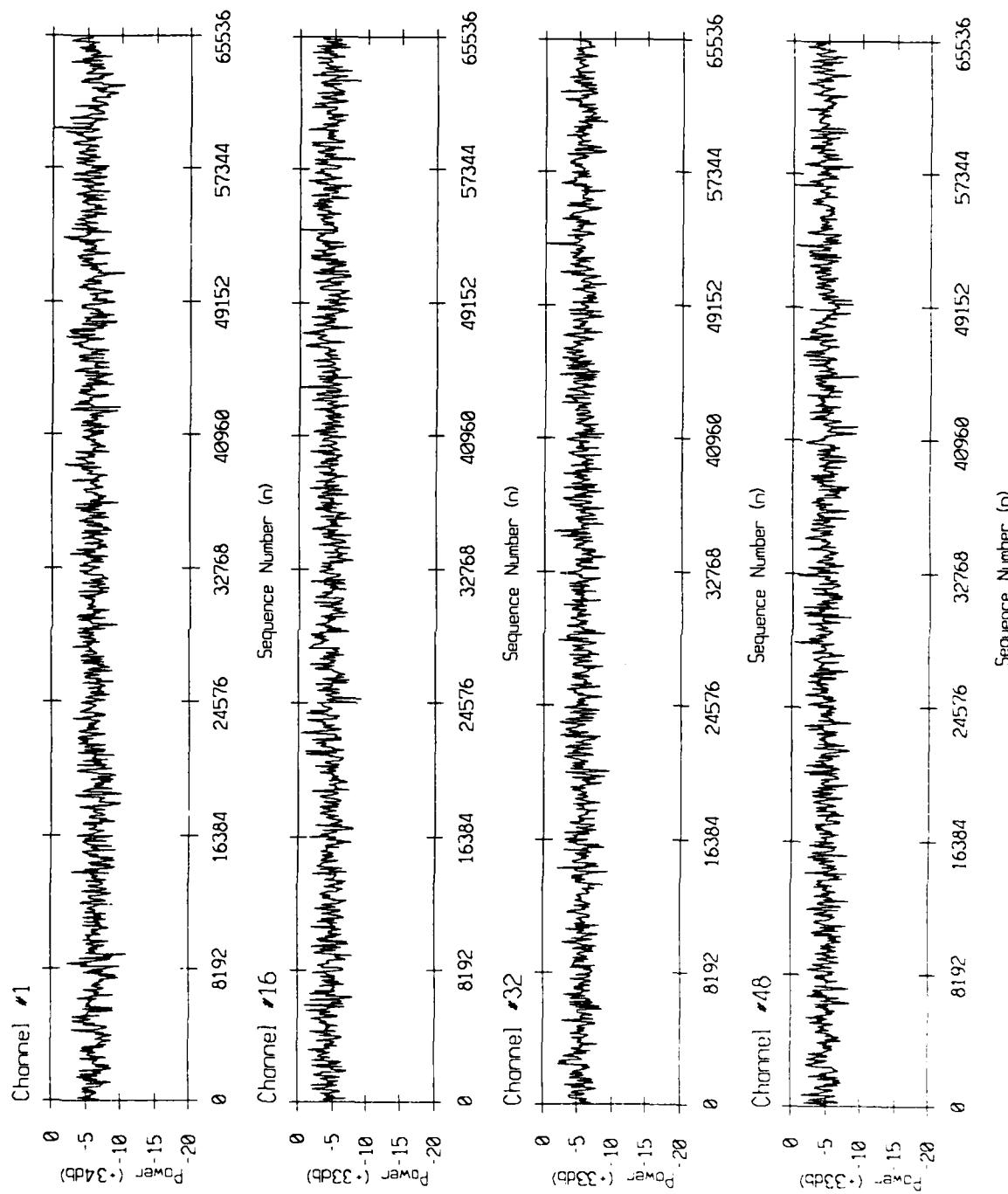


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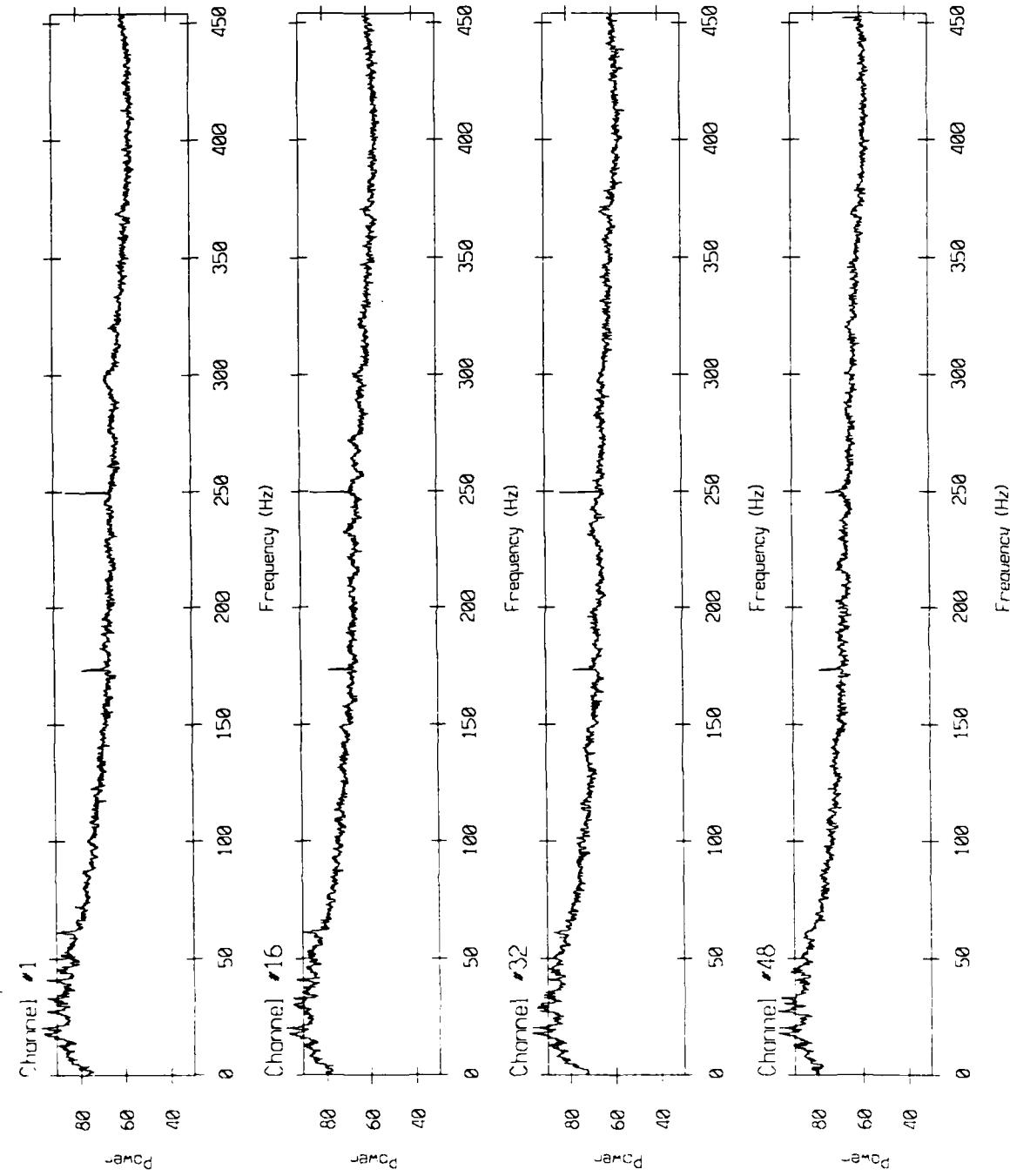
Time Series Mean - 85010.1



Time Series Power - 85010.1

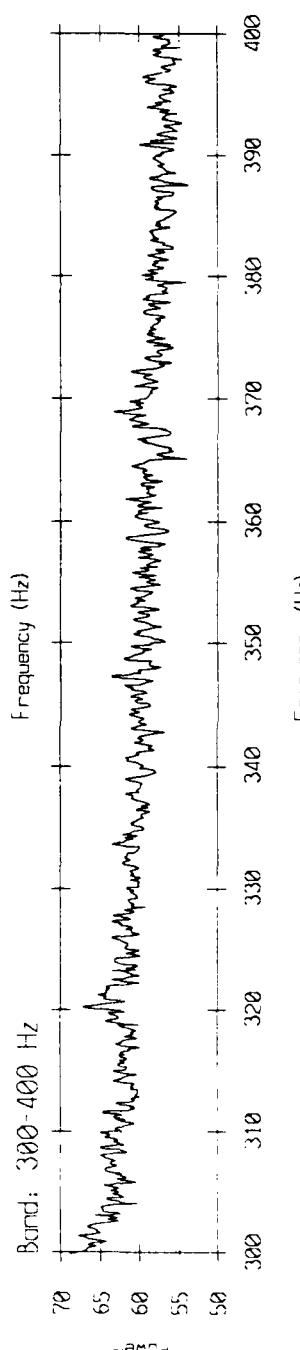
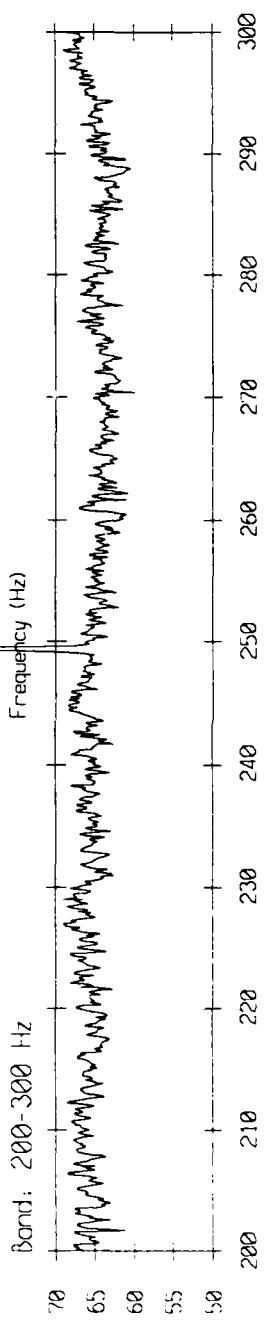
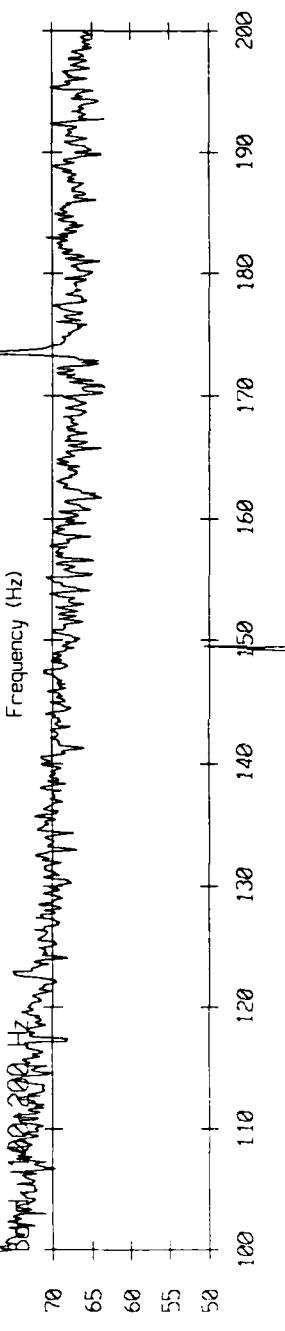
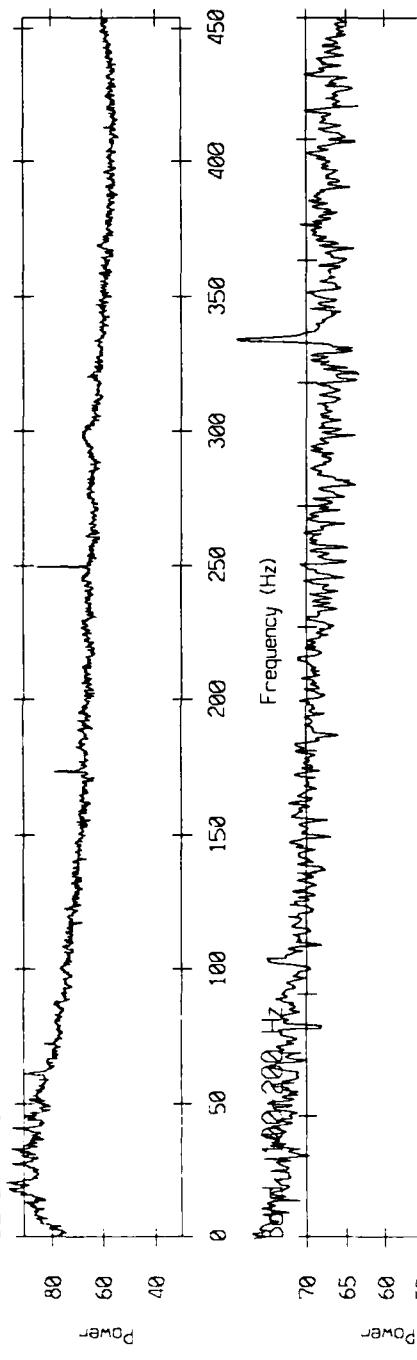


Power Spectrum - 85010.1



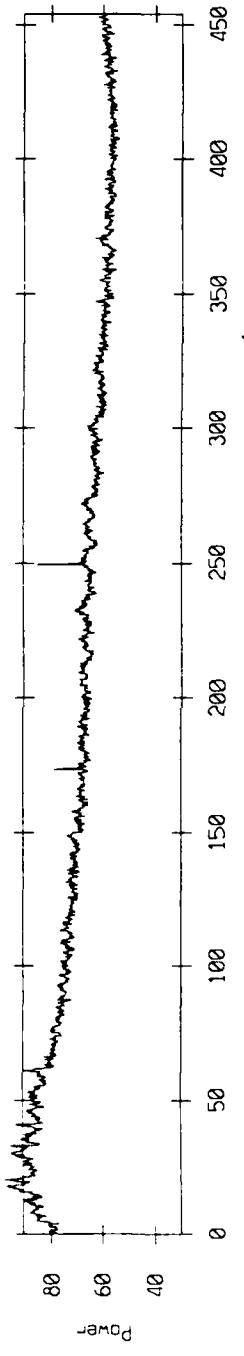
Power Spectrum - 85010.1 Channel #1

Band: 0-450 Hz



Power Spectrum - 85010.1 Channel 16

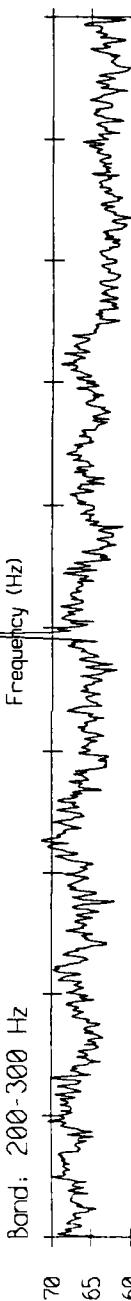
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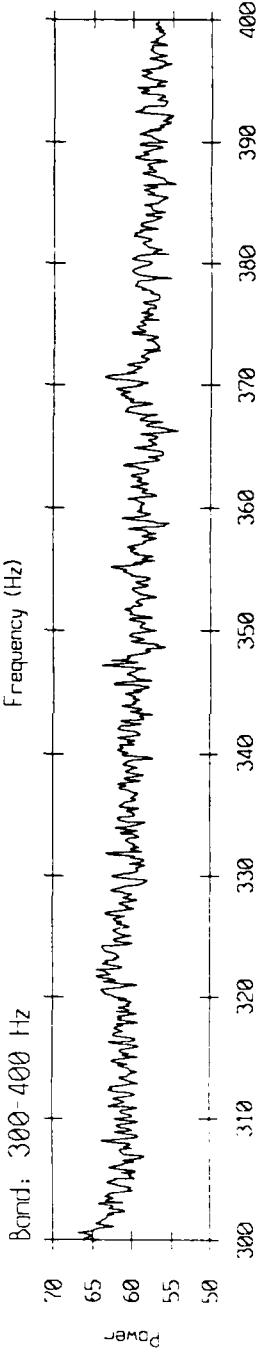
Frequency (Hz)



Band: 200-300 Hz



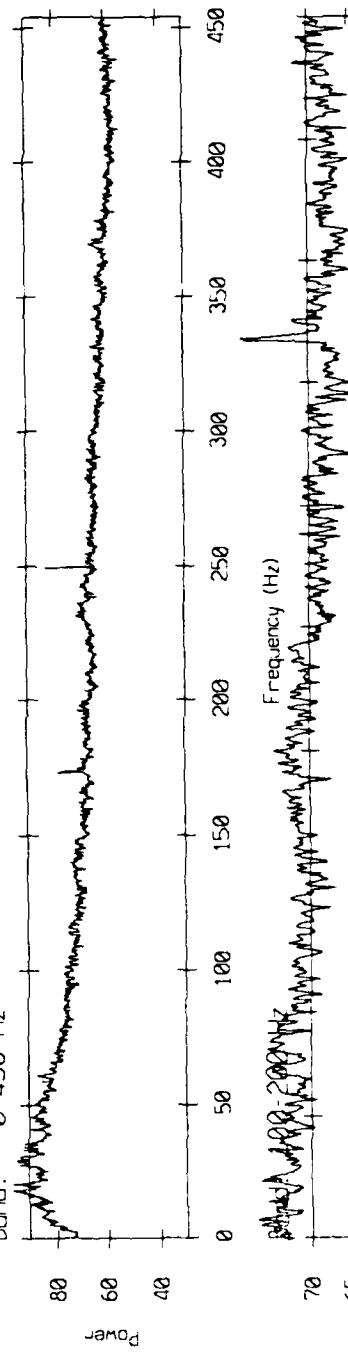
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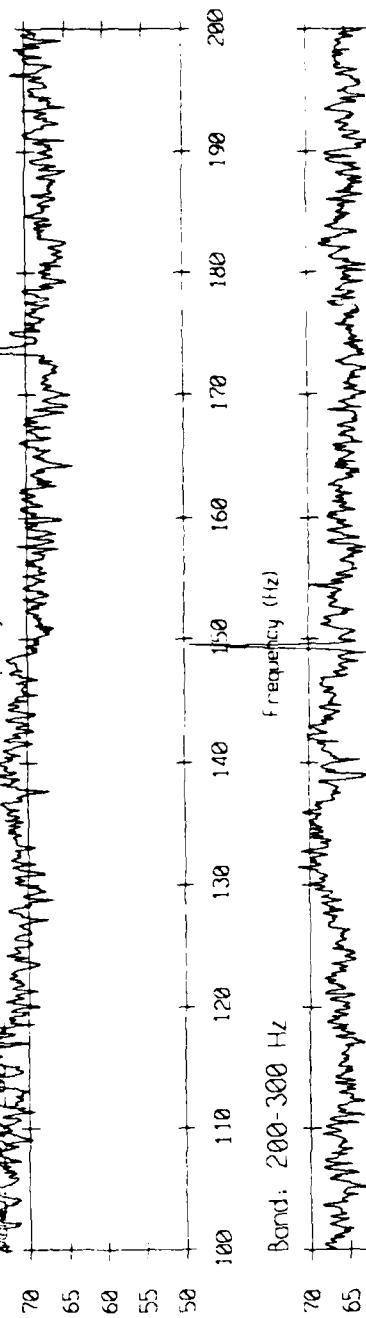
Frequency (Hz)

Power Spectrum - 85010.1 Channel #32

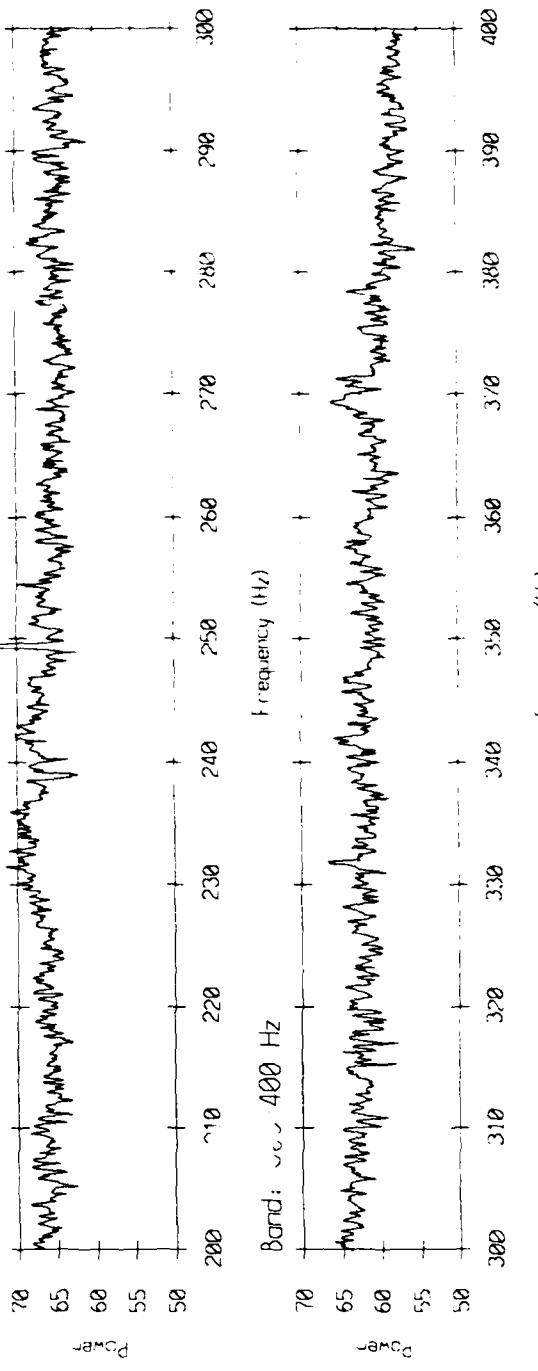
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Band: 200-300 Hz

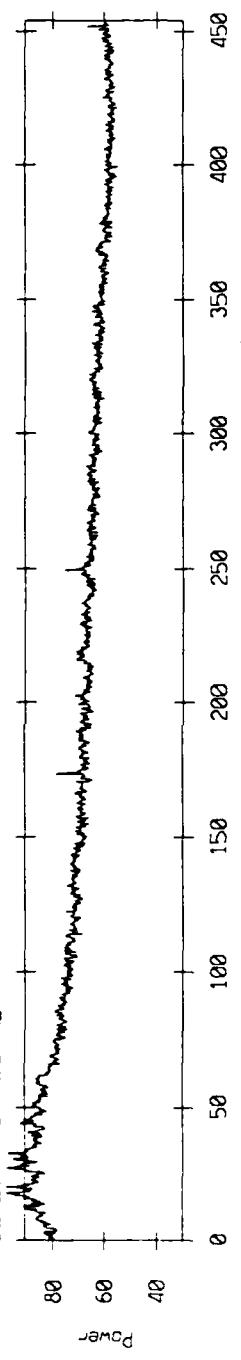


Band: > 300 Hz



Power Spectrum - 85010.1 Channel #48

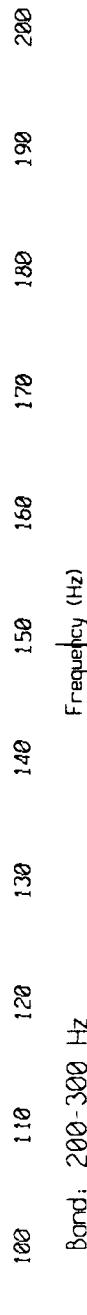
Band: 0-450 Hz



Band: 200-300 Hz



Band: 300-400 Hz



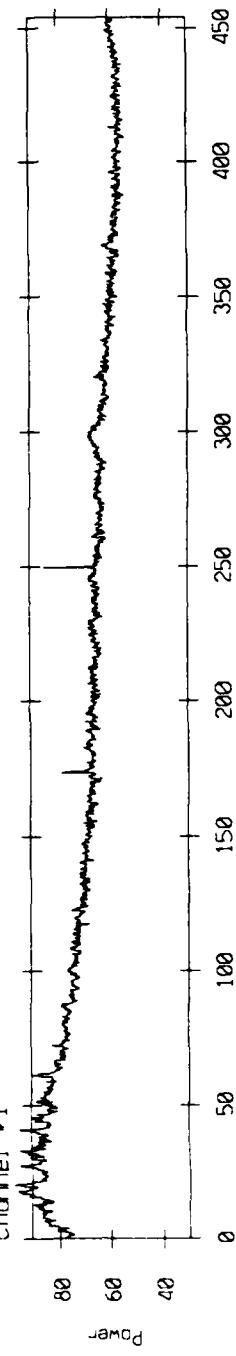
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Channel #2
1 -22. 289398193359
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Channel #4
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Channel #5
1 14. 029907226563
Channel #6
1 20. 884002685547
Channel #7
1 25. 631790161133
Channel #8
1 -18. 619995117186
Channel #9
1 -25. 978164672952
Channel #10
1 14. 312759399414
Channel #11
1 -11. 118469232231
Channel #12
1 -63. 520904341Cie
Channel #13
1 -33. 608383178711
Channel #14
1 -28. 023223876953
Channel #15
1 -2. 0163574218750
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1 -7. 2846832275391
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1 -38. 473198486326
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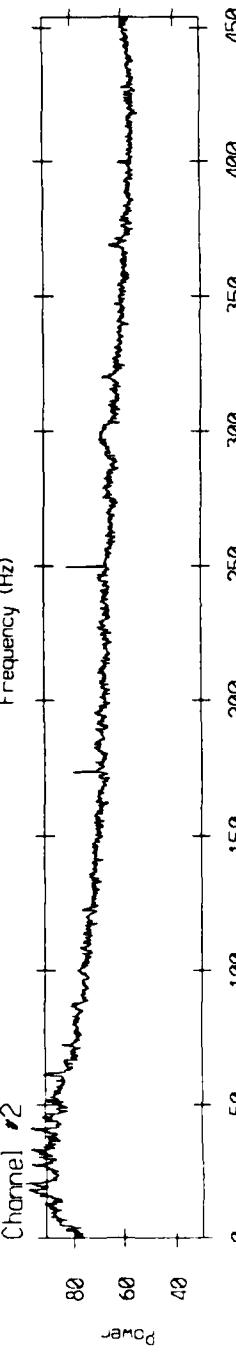
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Channel #36
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1 27. 986678077148
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1 -5. 3696594238281
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Channel #44
1 -16. 118804931641
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1 -36. 901565551752
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Power Spectrum - 85010.1

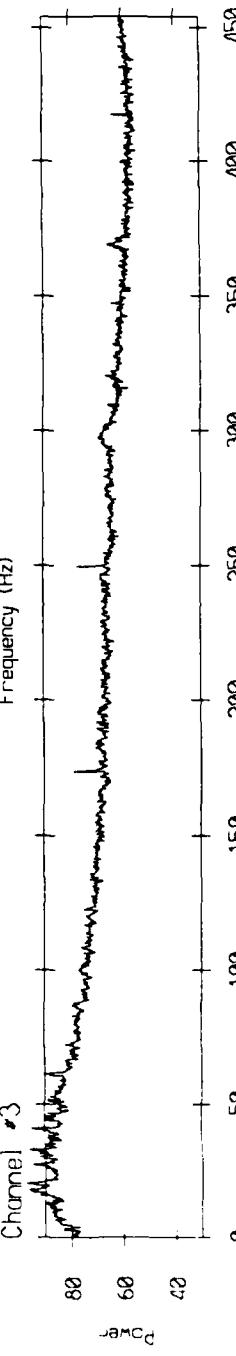
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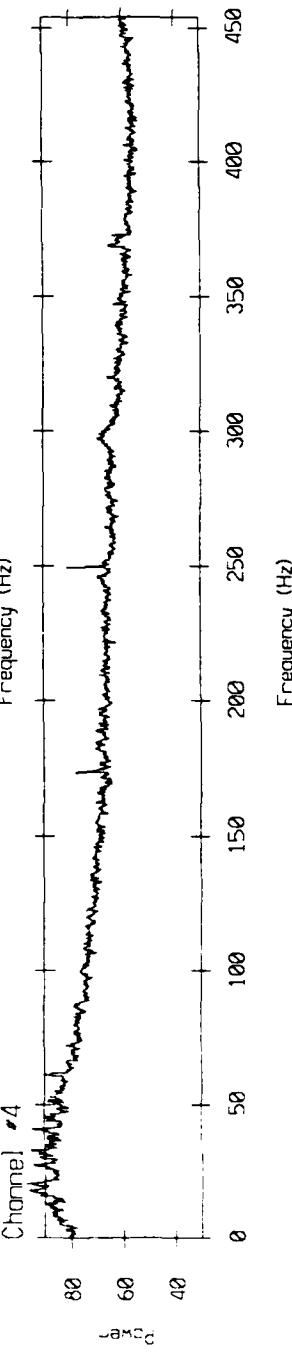
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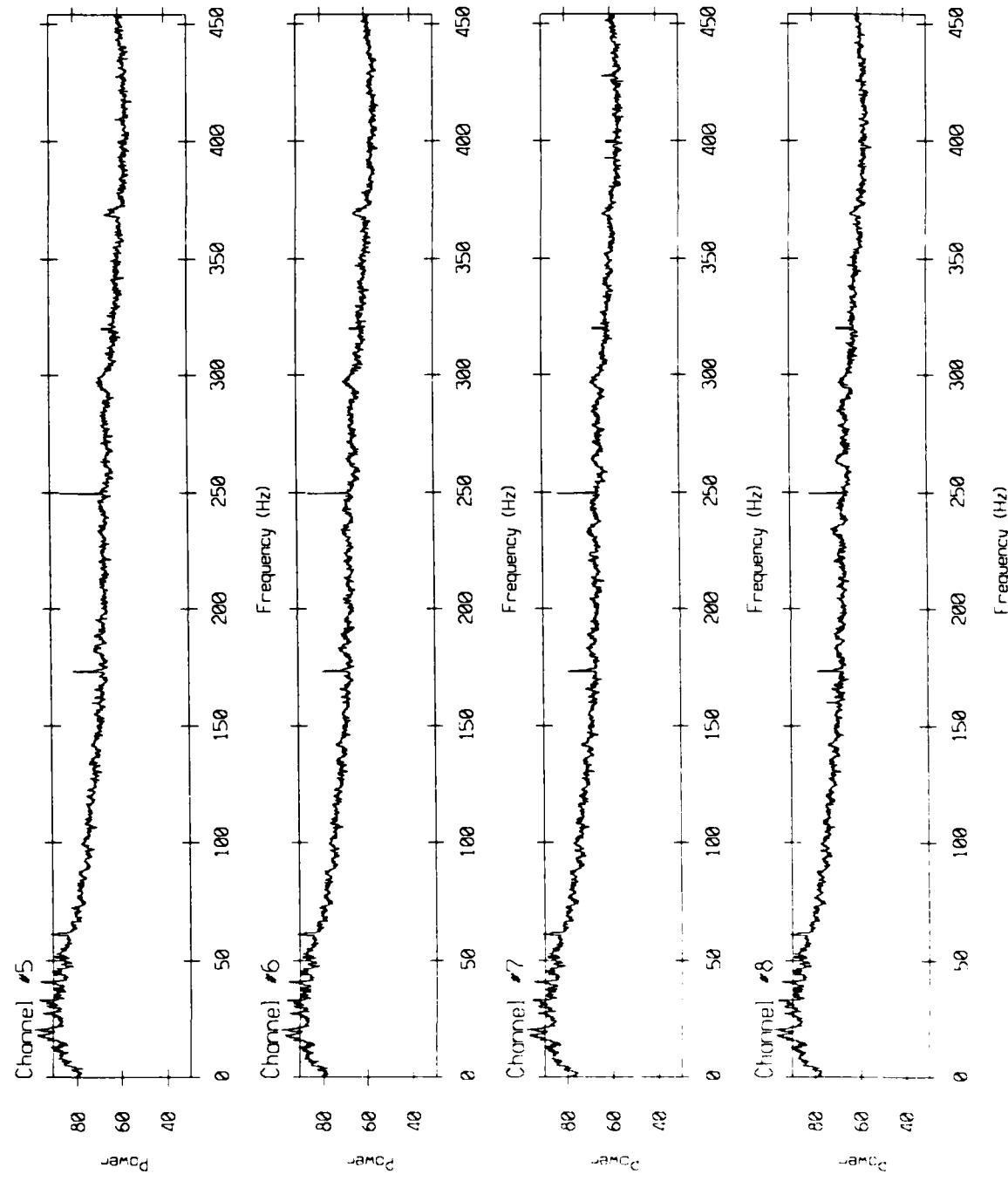


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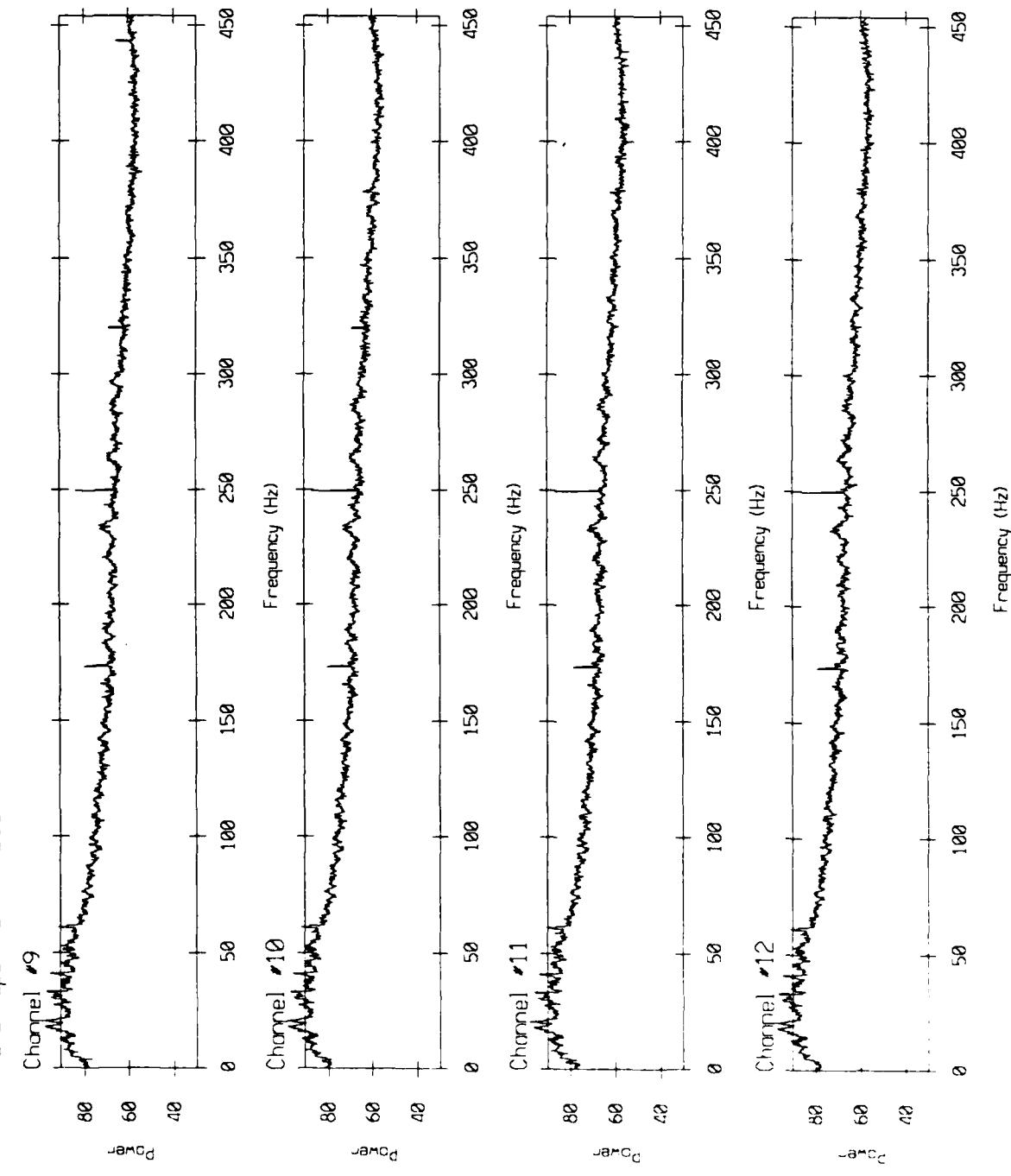


Frequency (Hz)

Power Spectrum - 85010.1

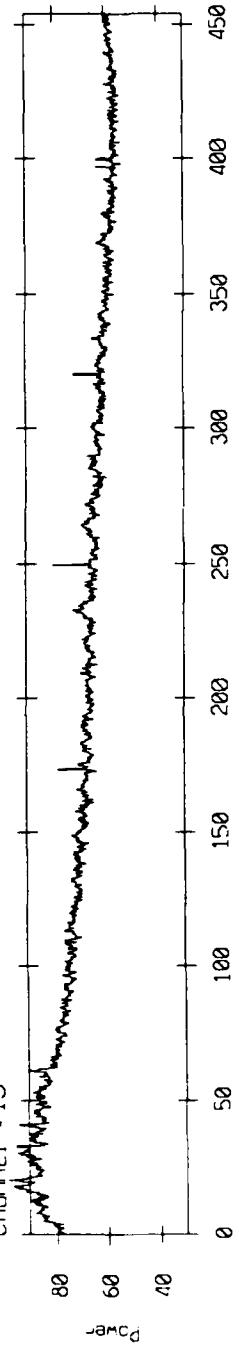


Power Spectrum - 85010.1

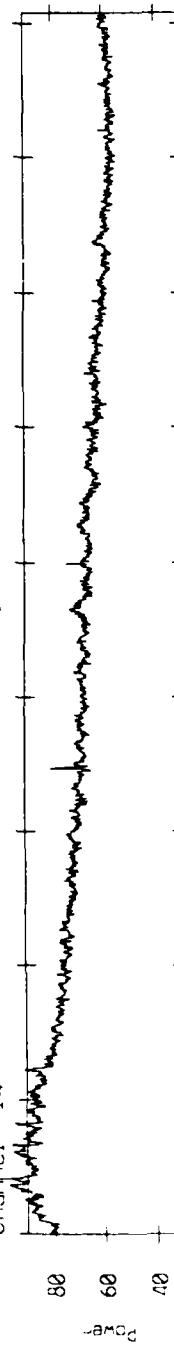


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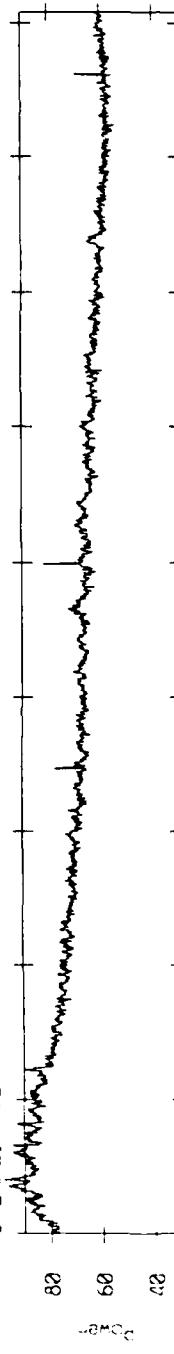
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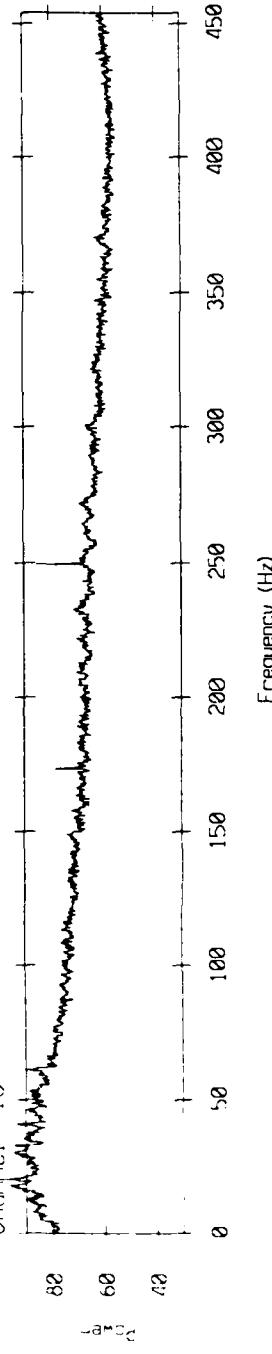
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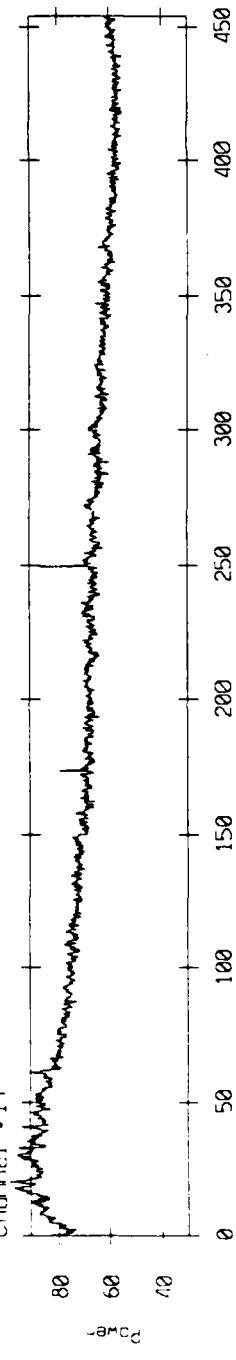
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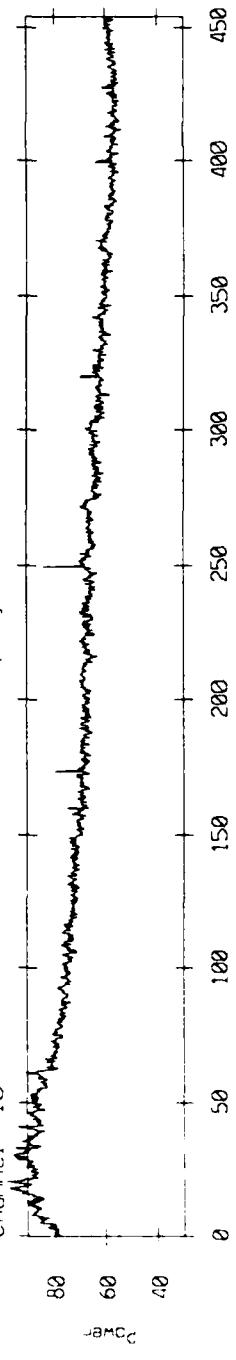
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Power Spectrum - 85010.1

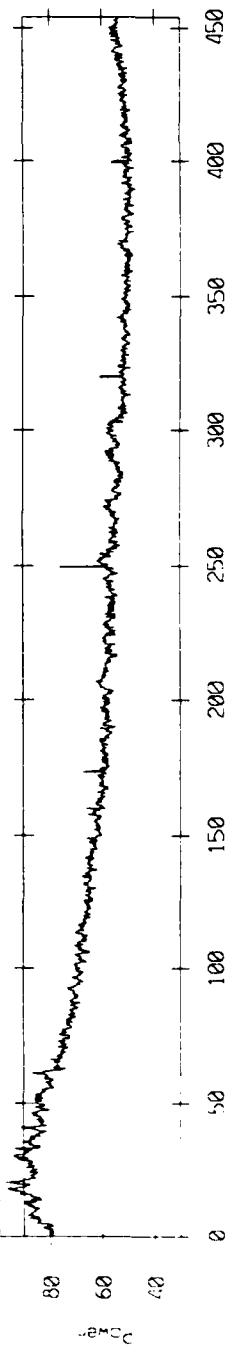
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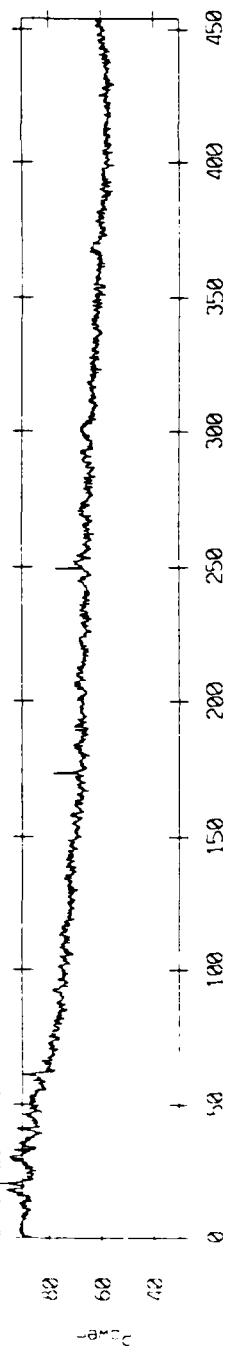
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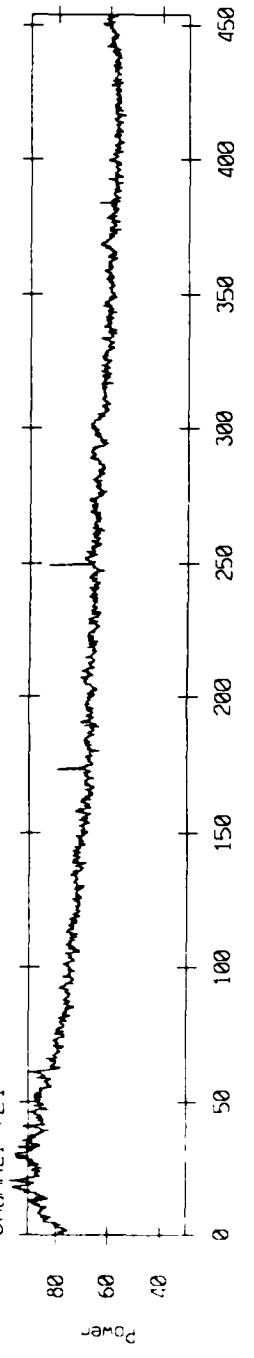
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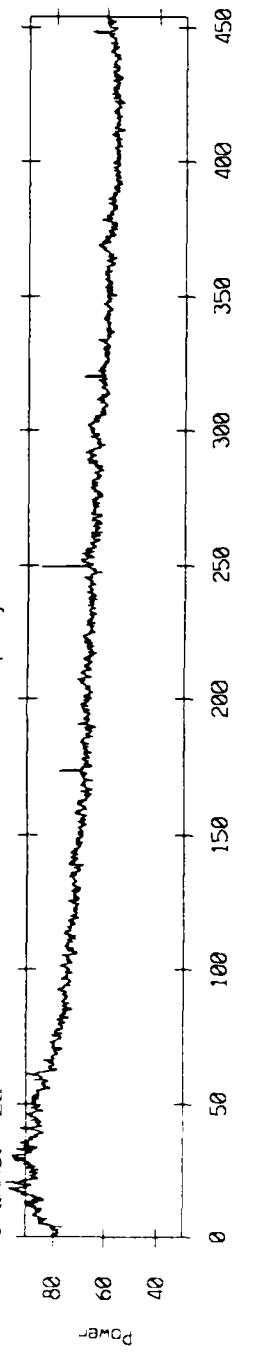
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Power Spectrum - 85010.1

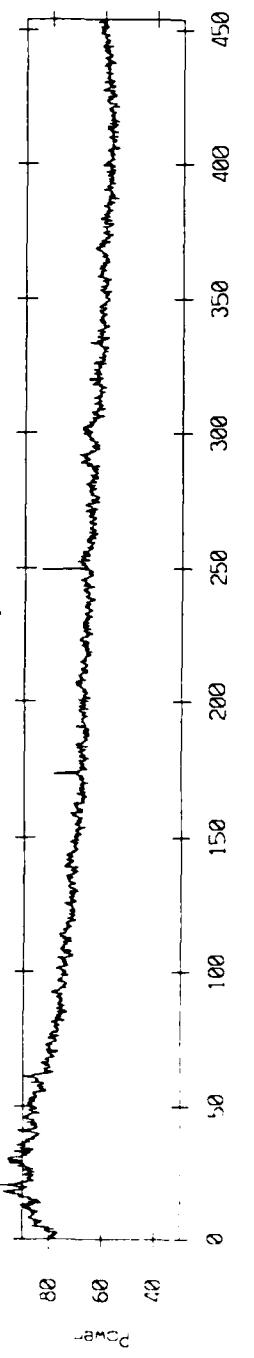
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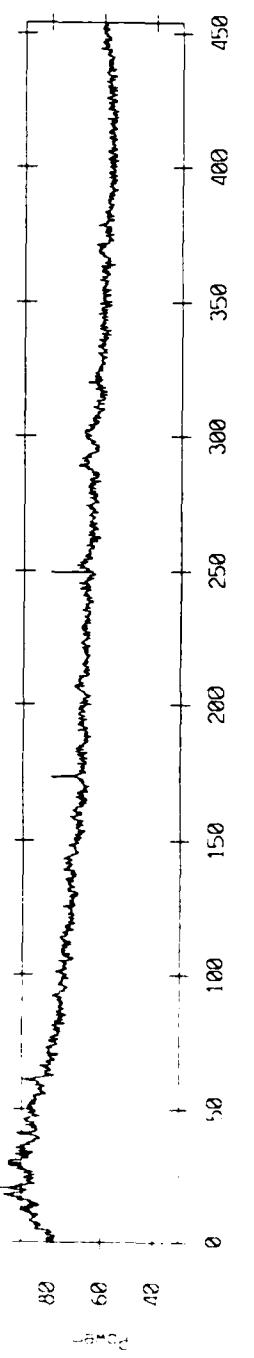
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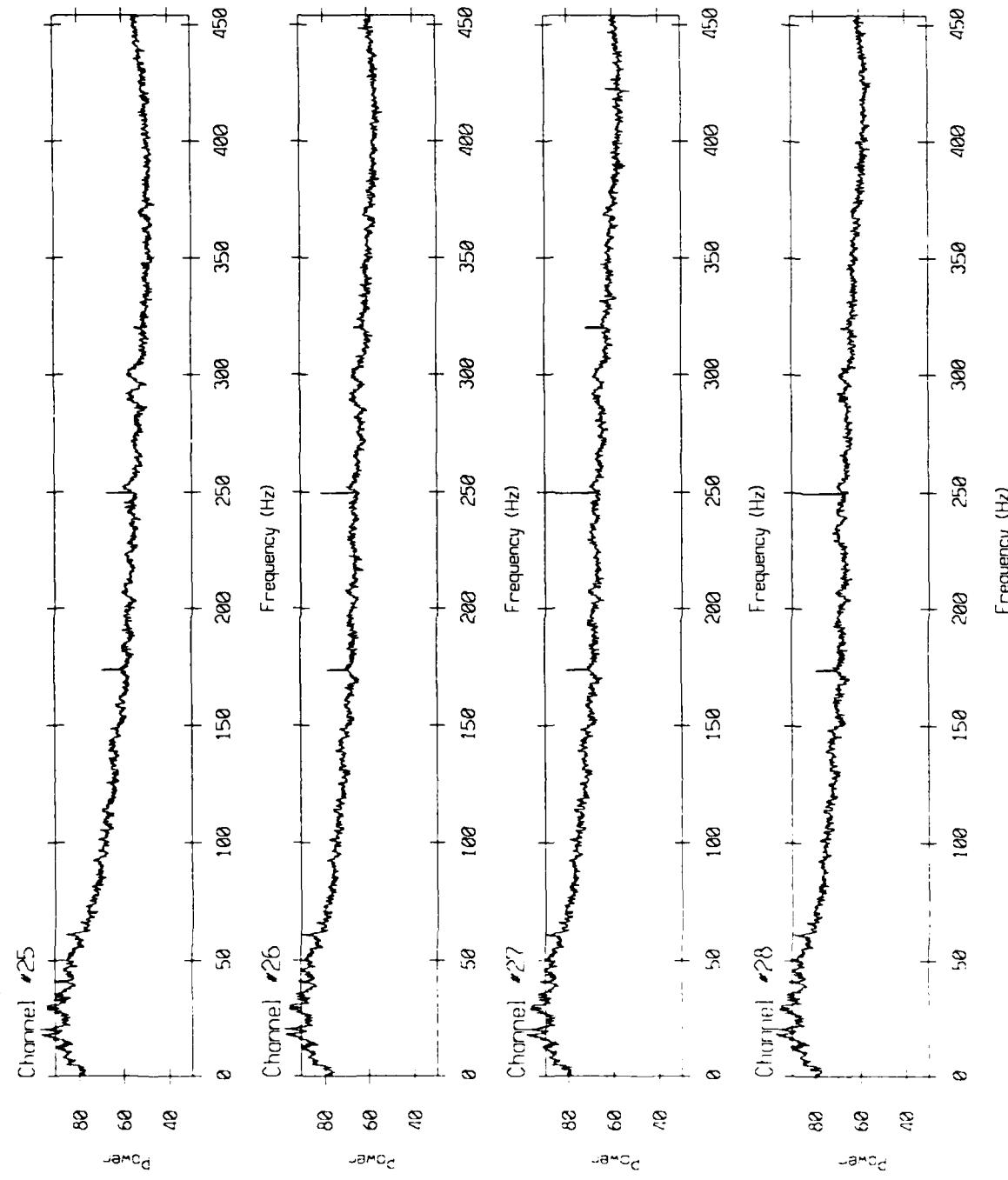
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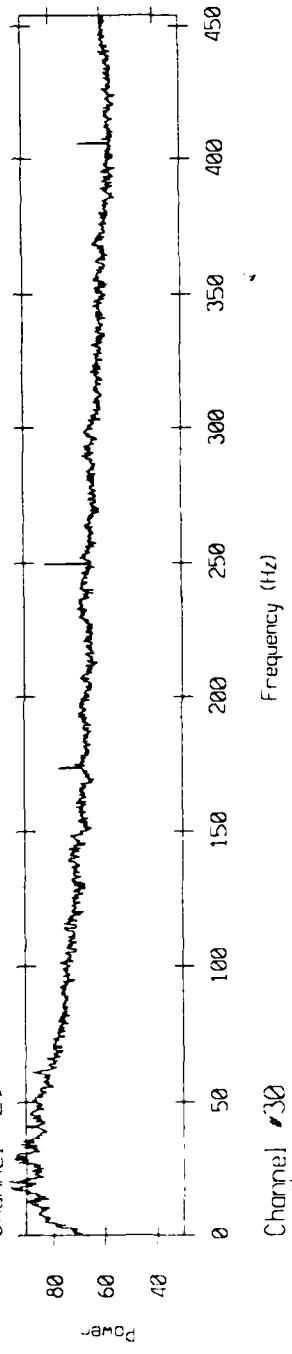


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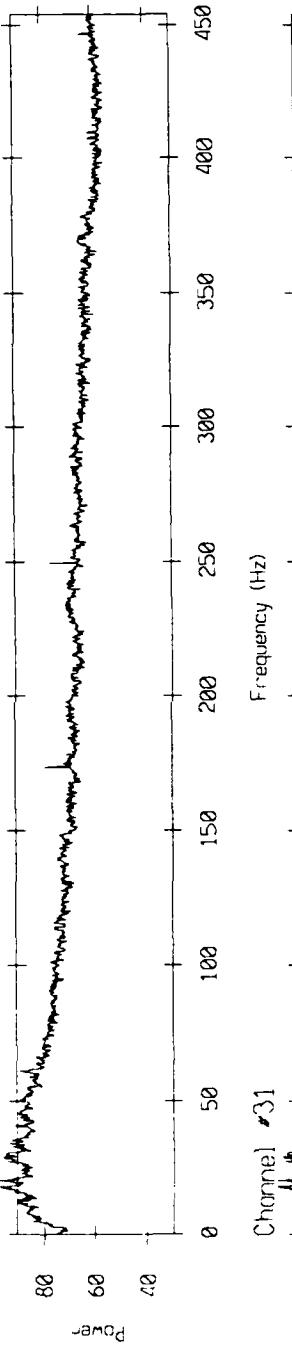


Power Spectrum - 85010.1

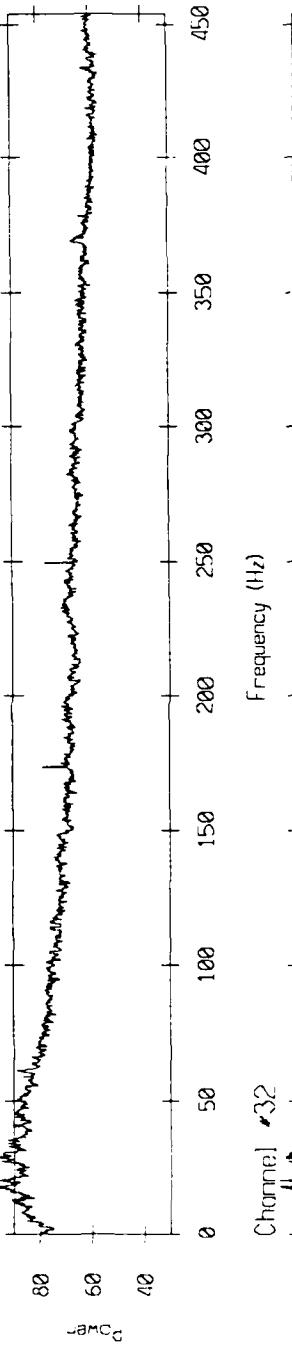
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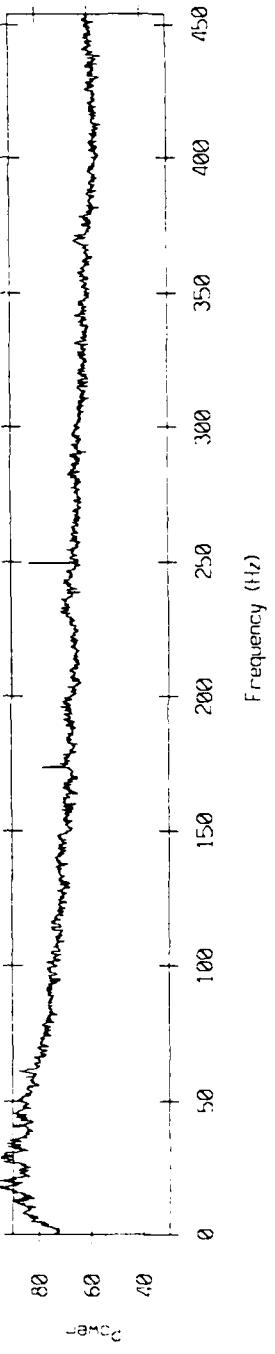
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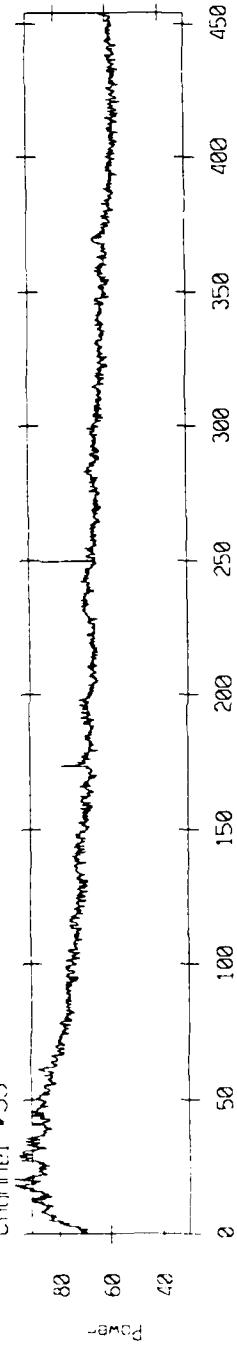


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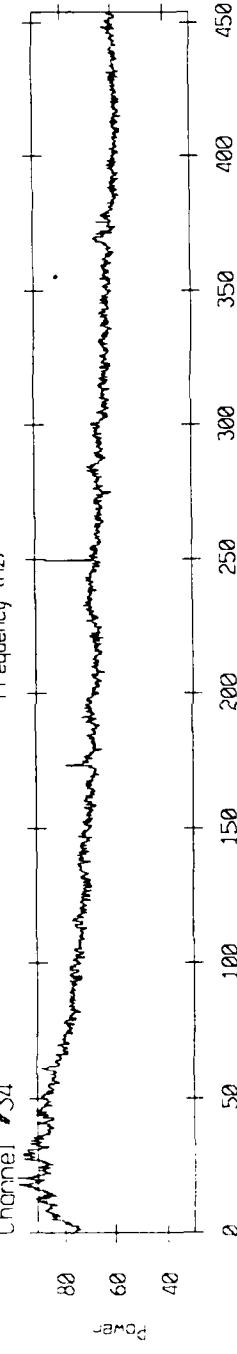


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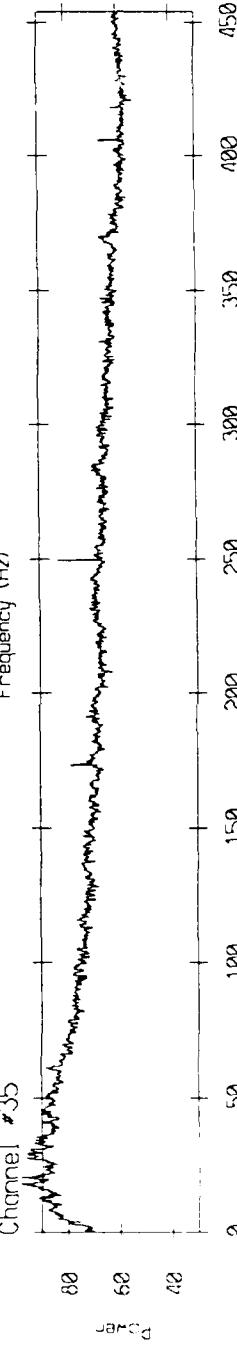
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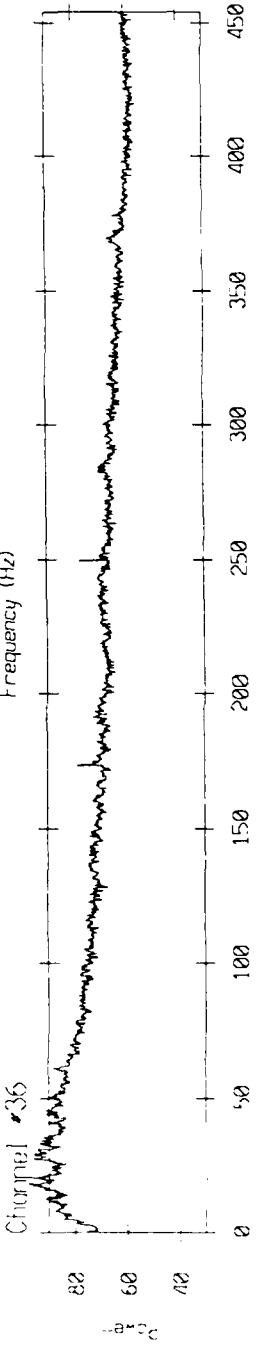
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Channel #35



Channel #36



Frequency (Hz)

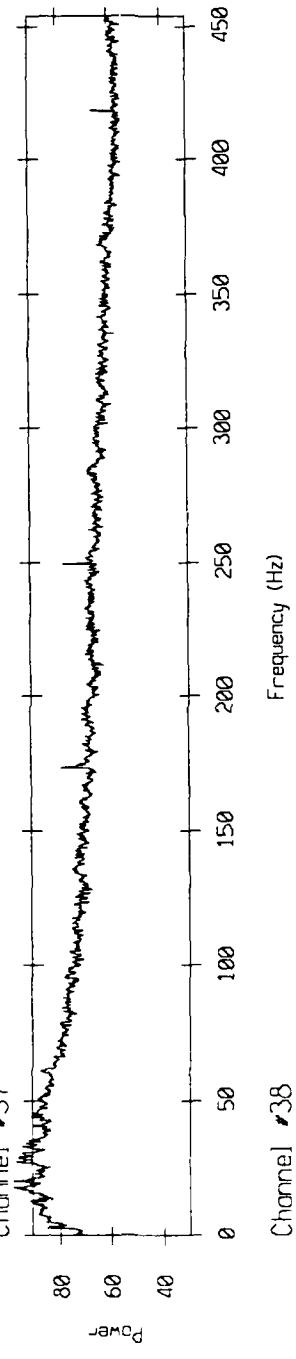
Frequency (Hz)

Frequency (Hz)

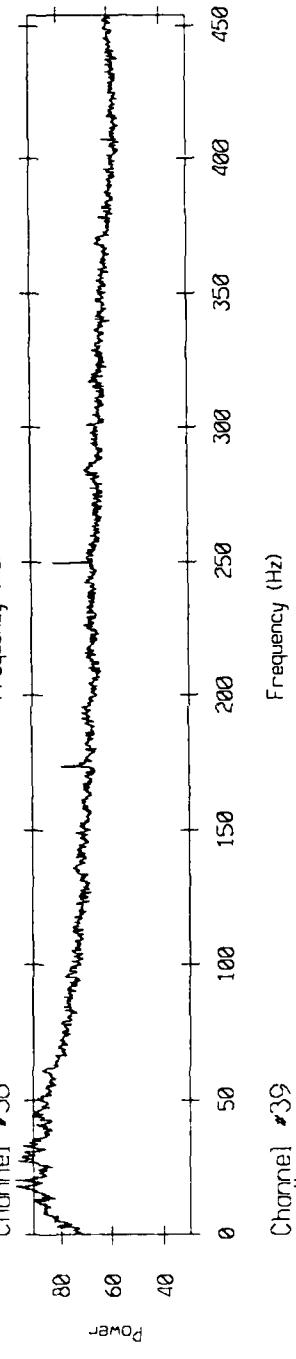
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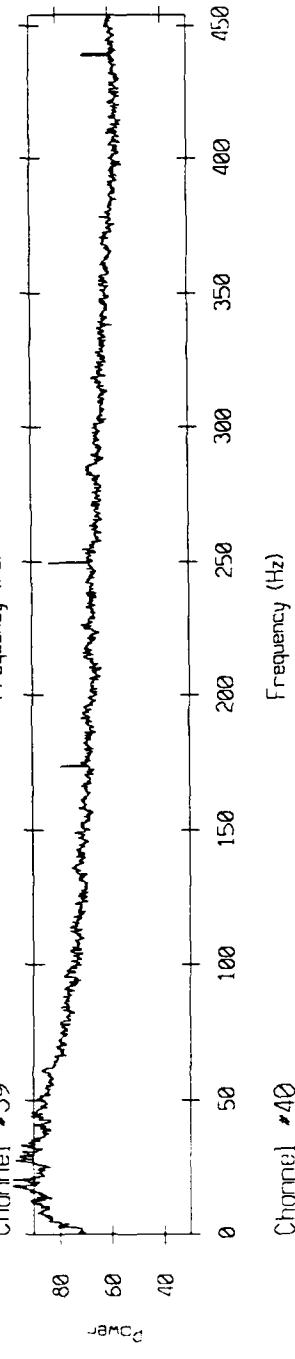
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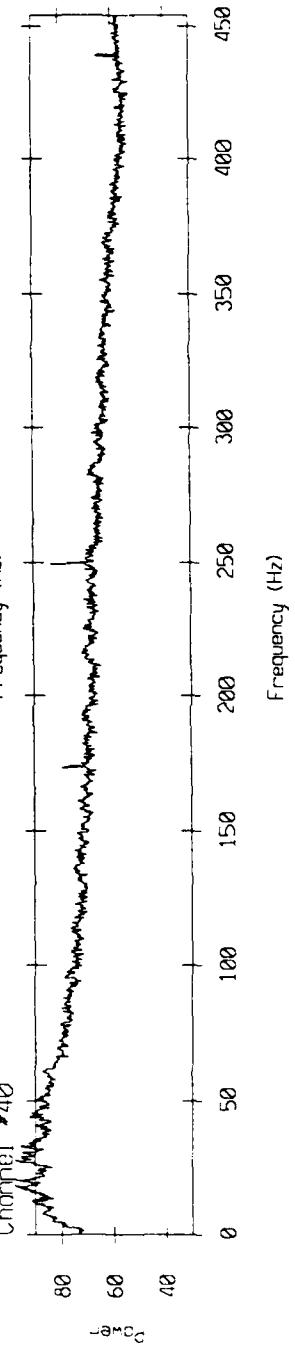
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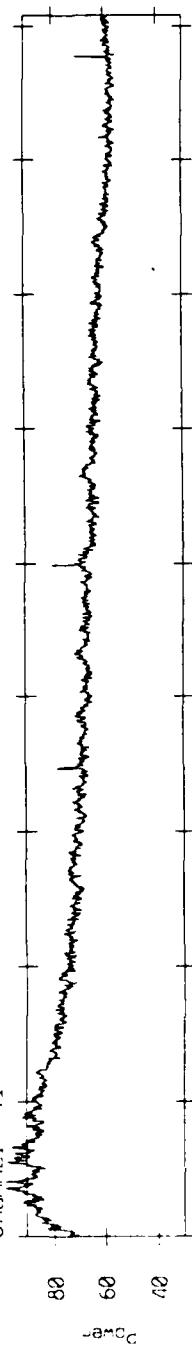


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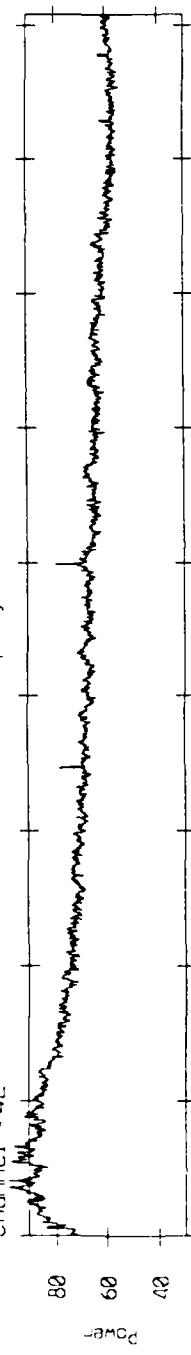


Power Spectrum - 85010.1

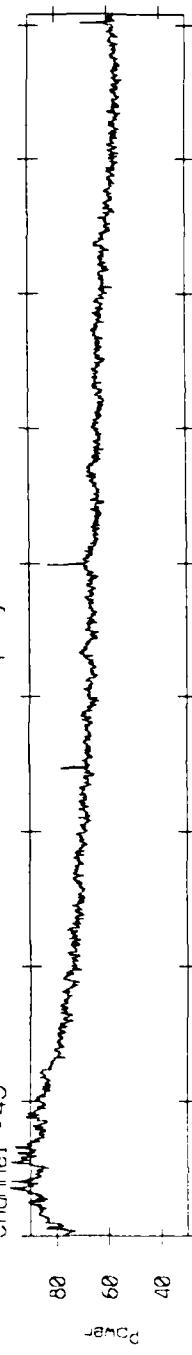
Channel #41



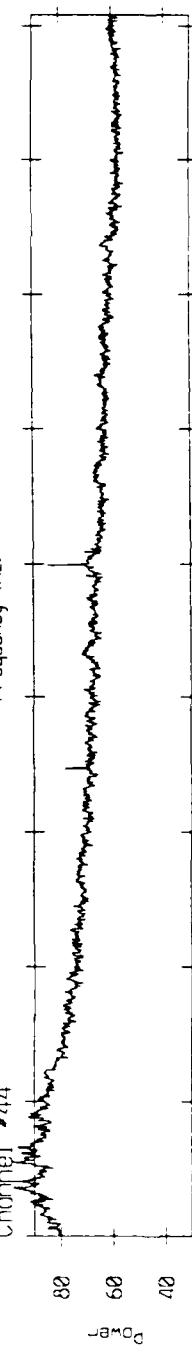
Channel #42



Channel #43

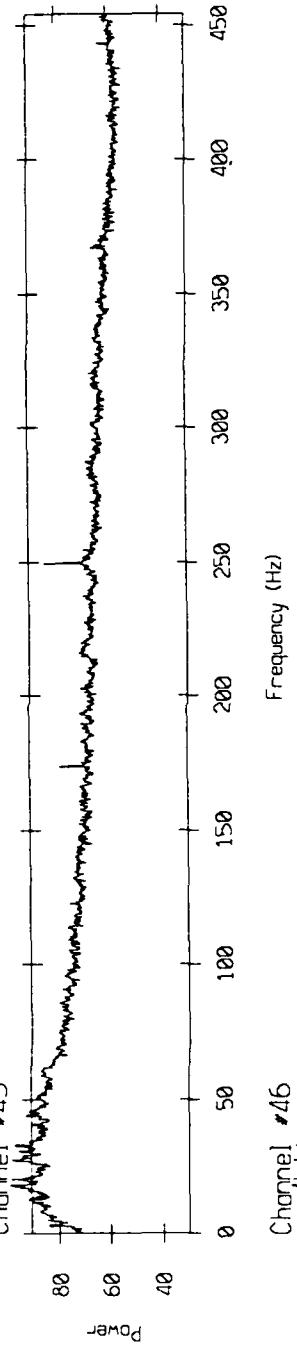


Channel #44

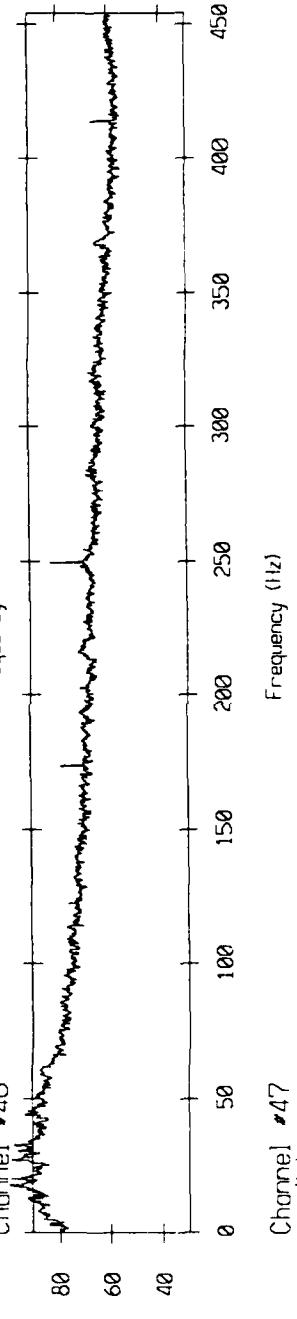


Power Spectrum - 85010.1

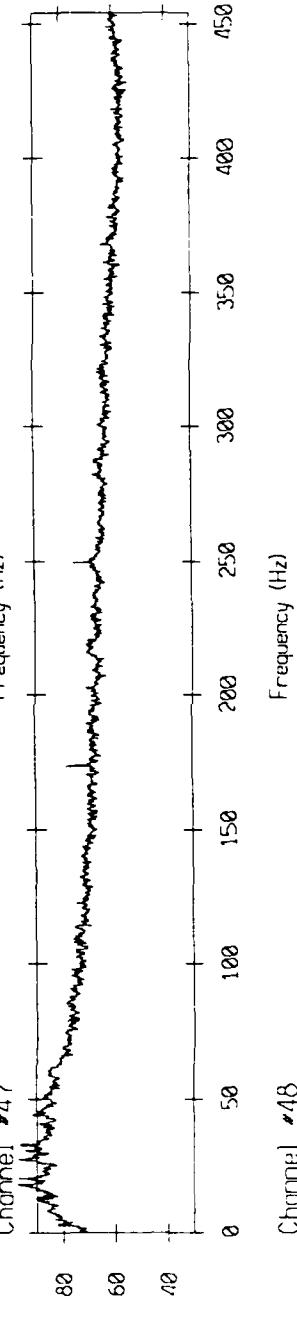
Channel #45



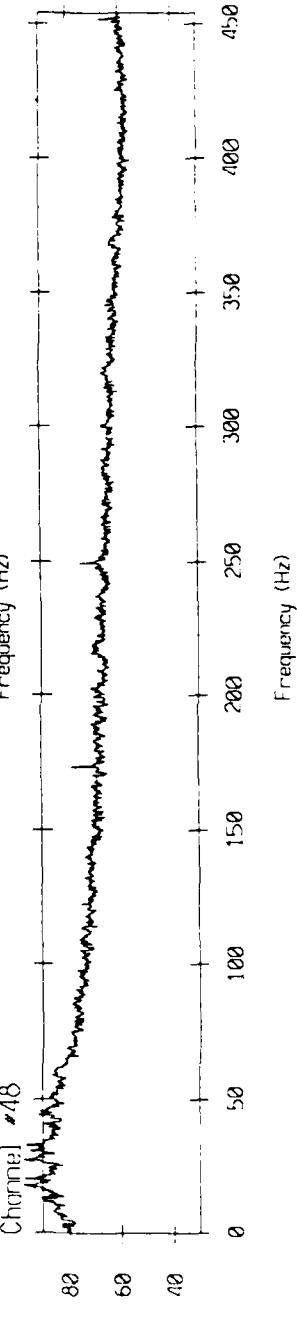
Channel #46



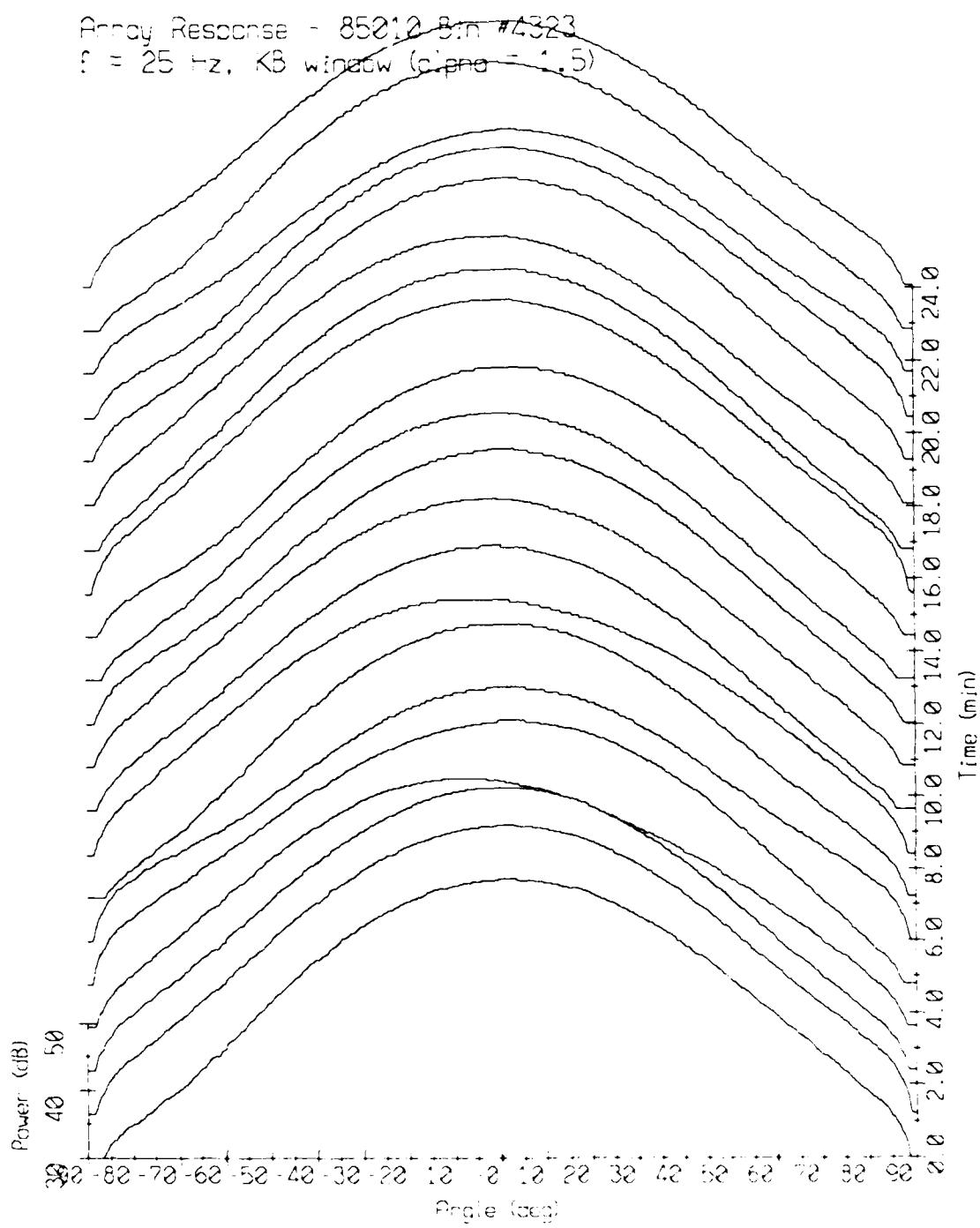
Channel #47

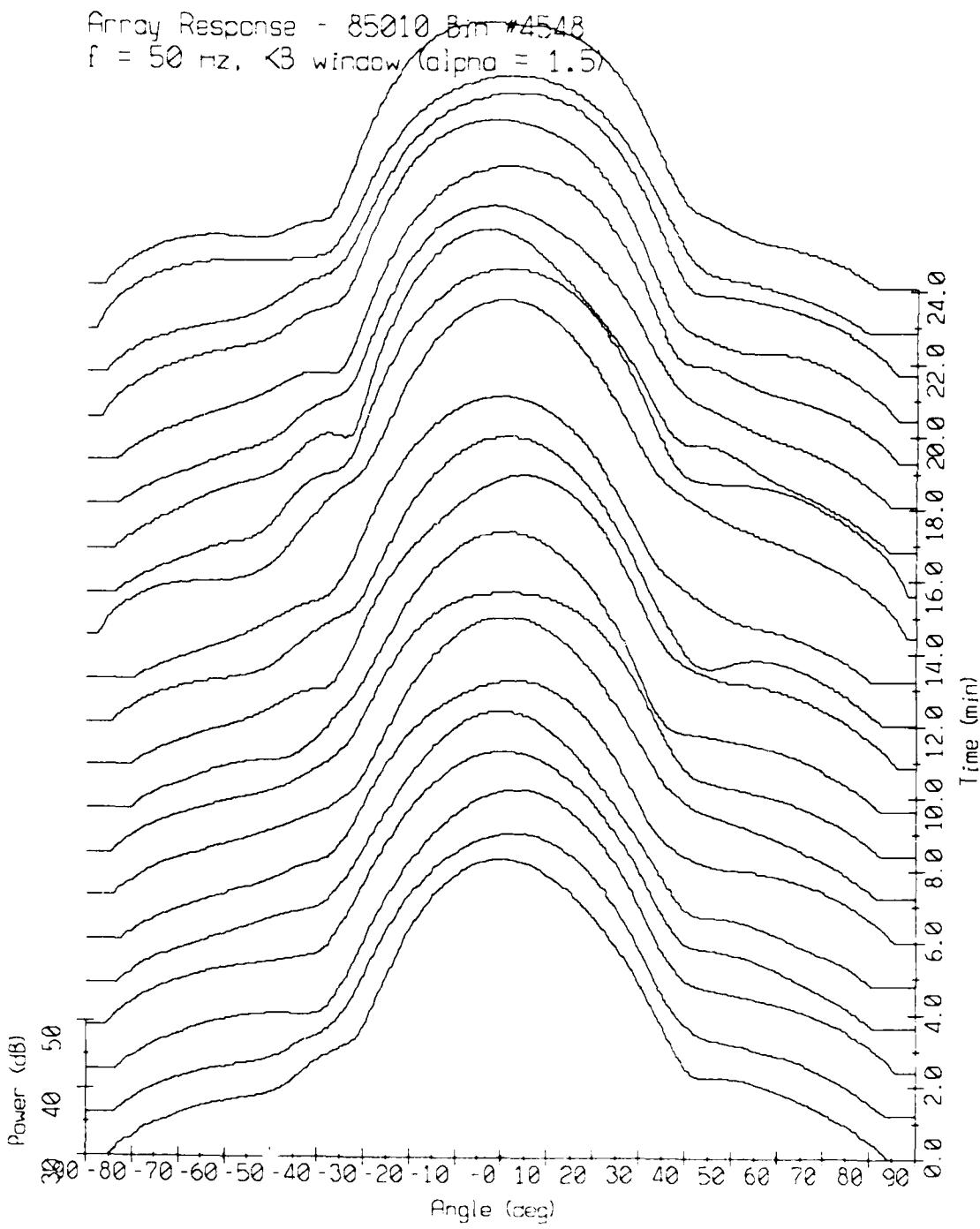


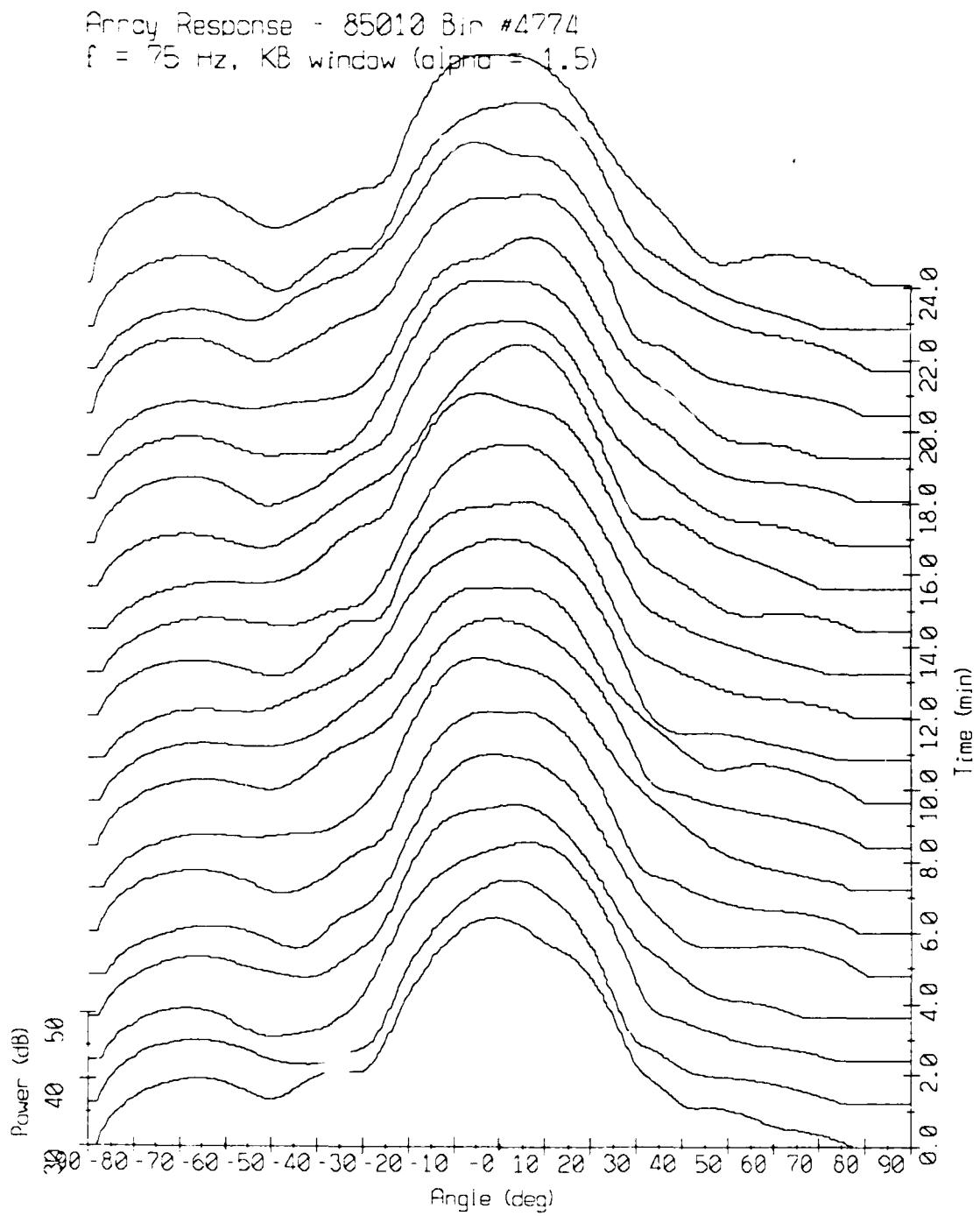
Channel #48



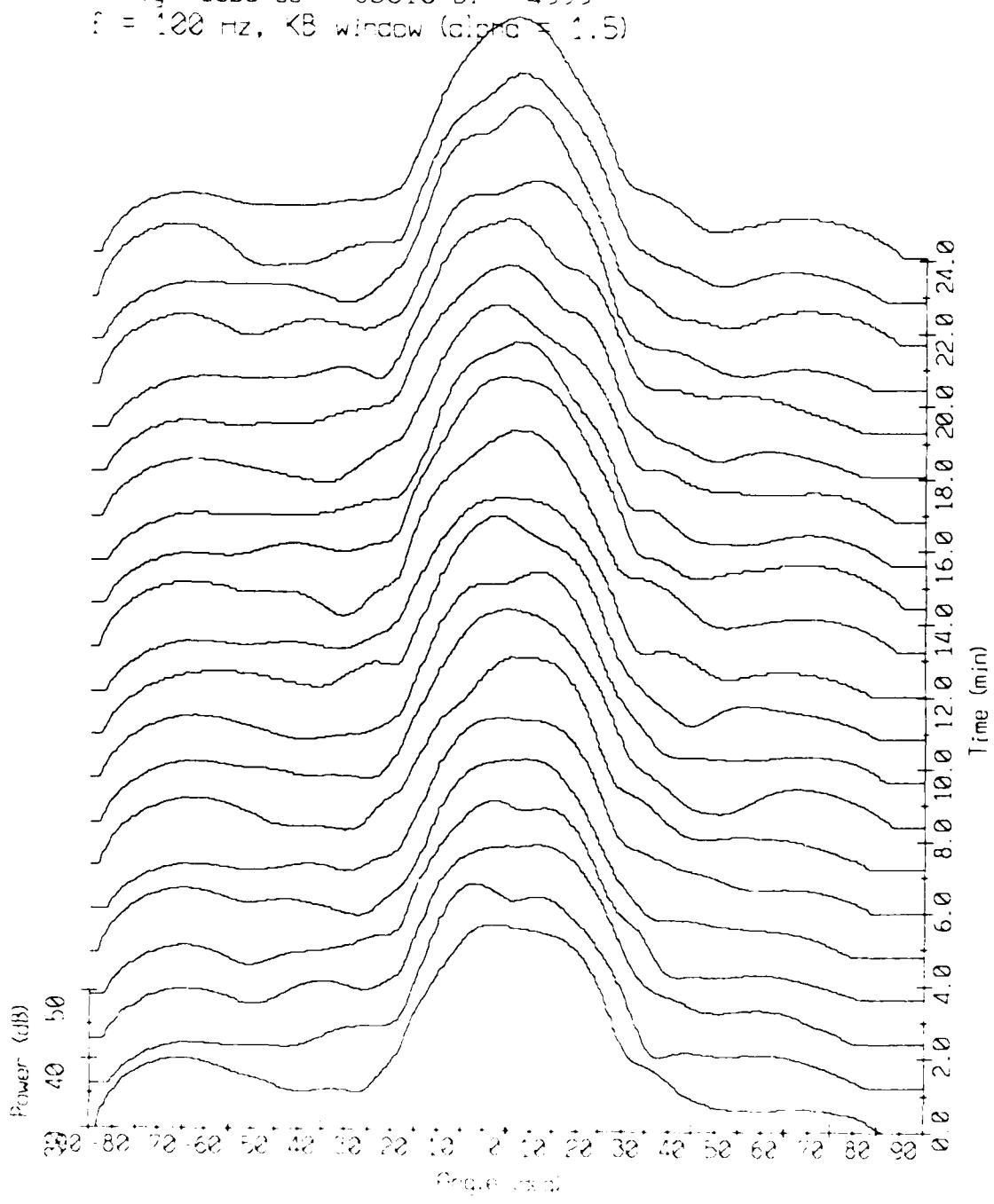
IV. Array Response: Waterfall, KB Window.



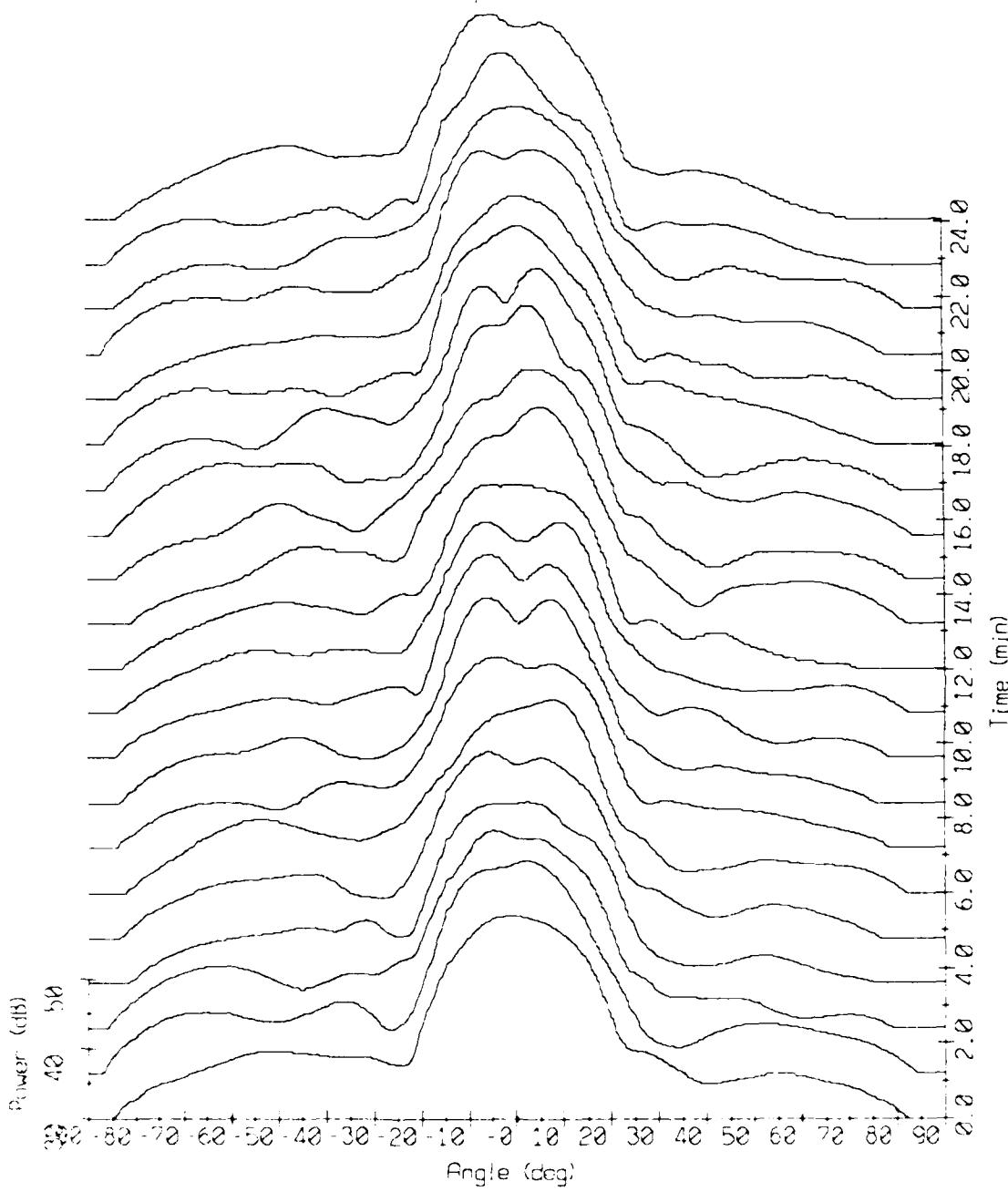




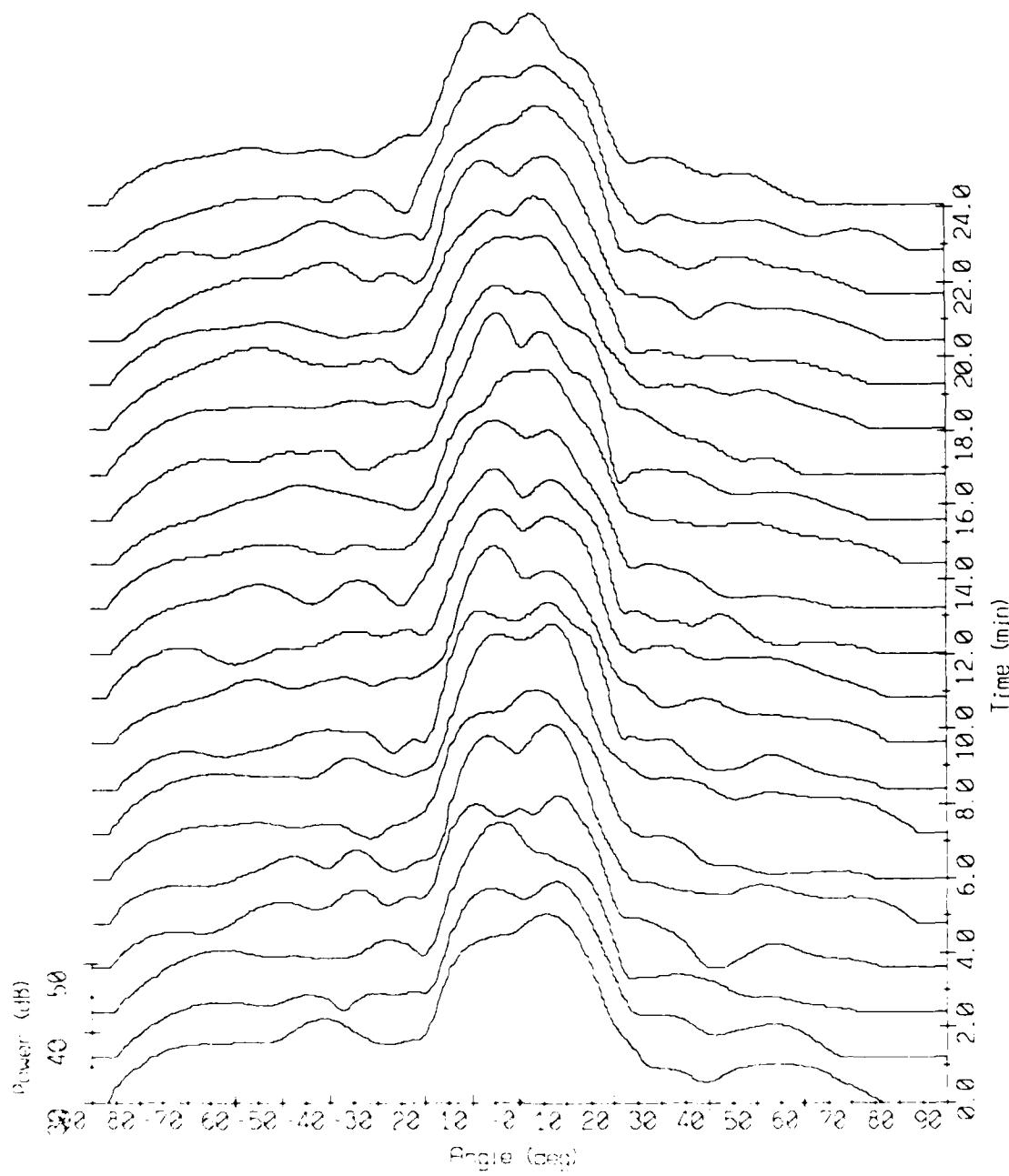
Array Response - 85210 Bir #4999
f = 120 Hz, KB window (clipc < 1.5)



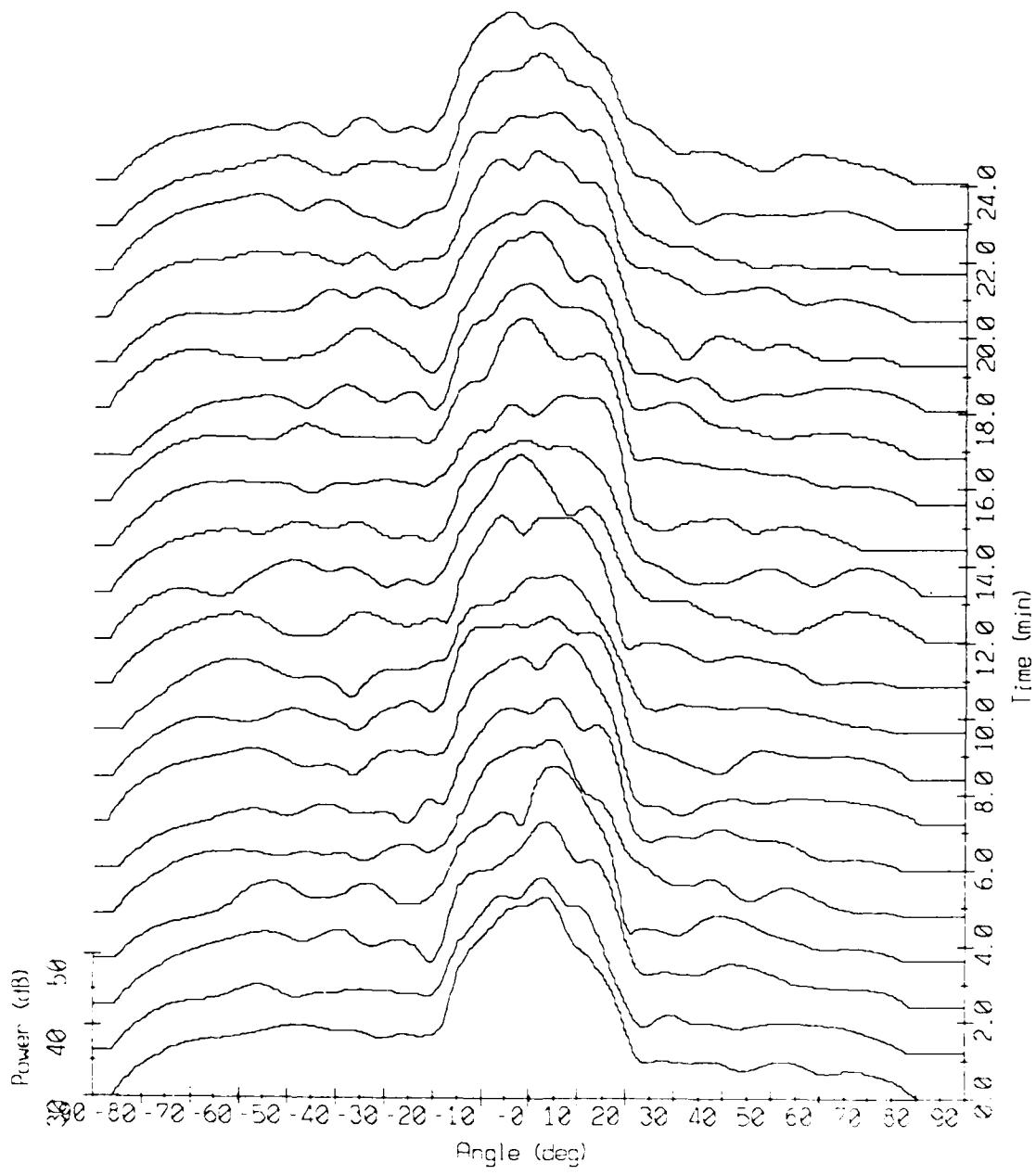
Grady Response - 85010 3/p #5225
 $f = 125$ Hz, $\times 8$ window ($\alpha = 1.5$)



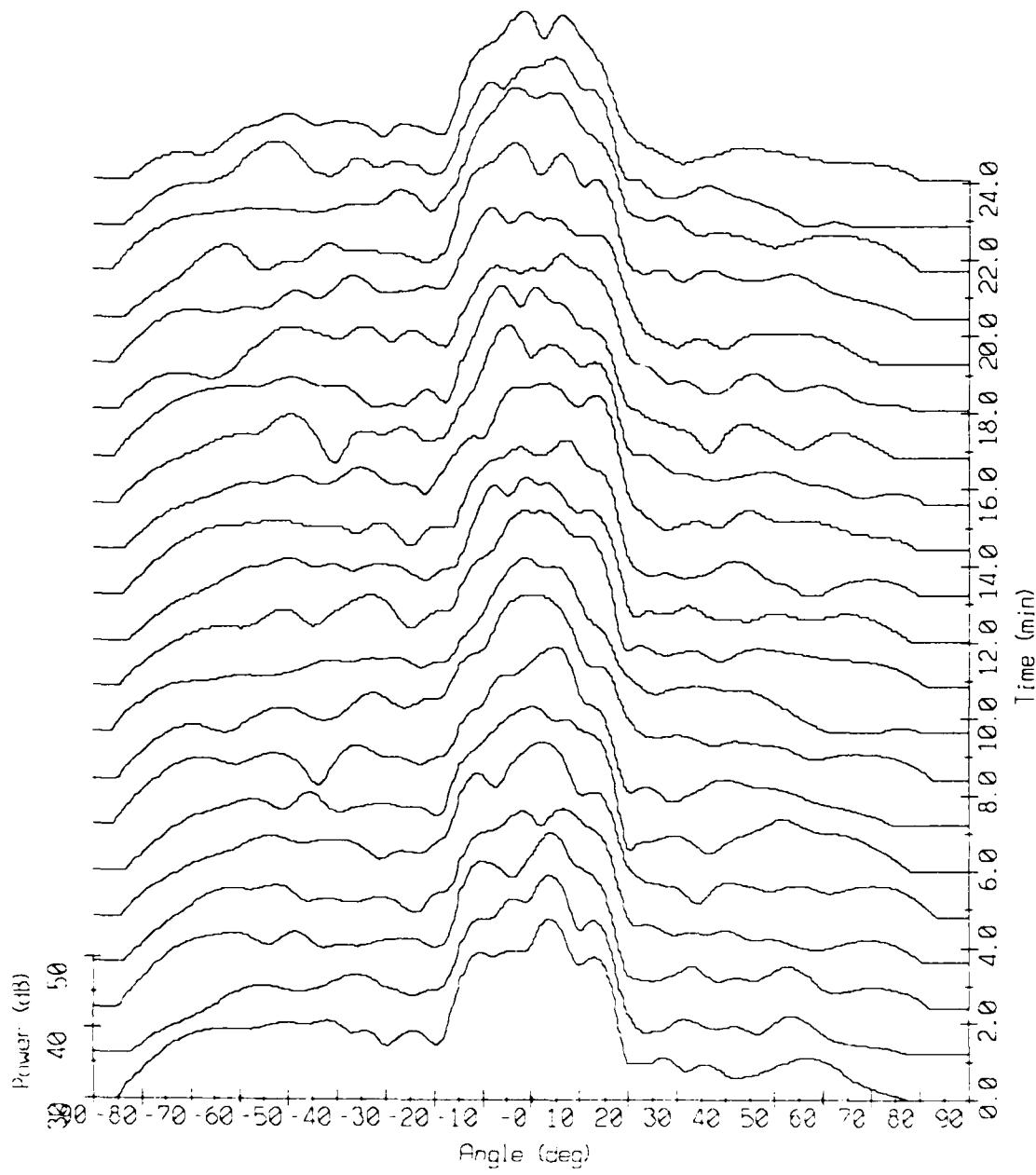
Array Response - 85010 Bin #5451
 $f = 150$ Hz, KB window ($\alpha = 1.5$)



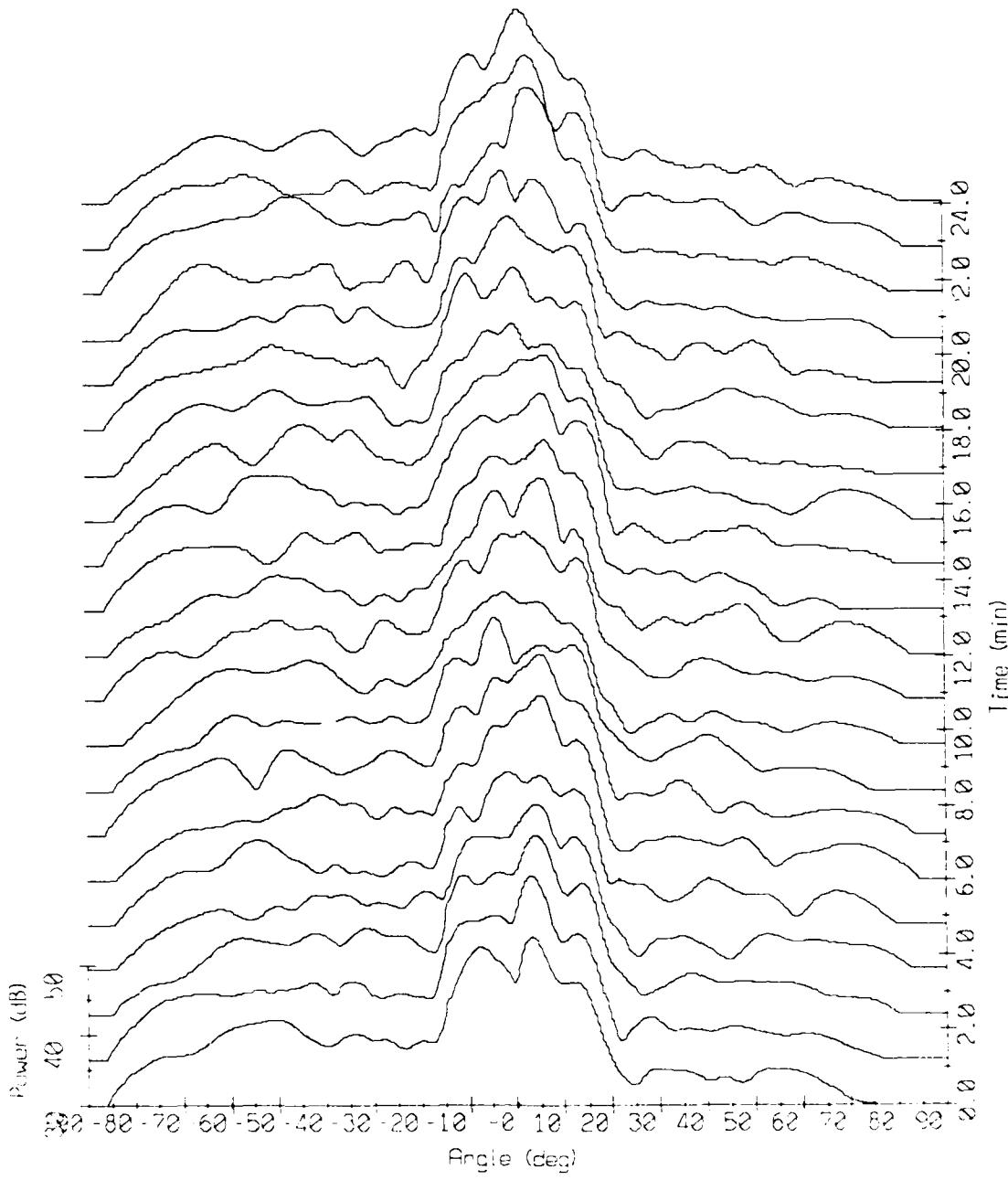
Array Response - 85010 Bin #5676
 $f = 175$ Hz, KB window ($\alpha = 1.5$)



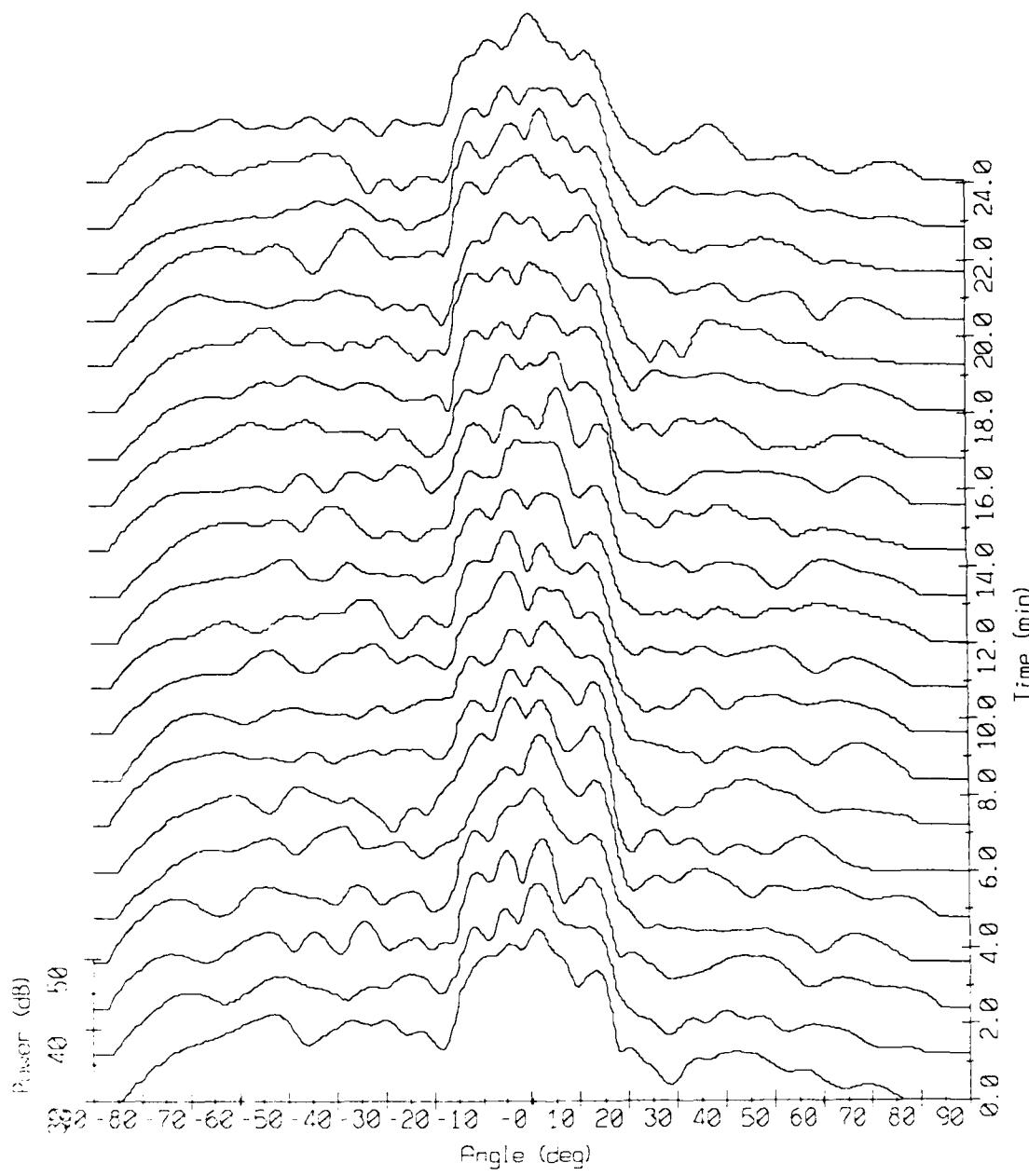
Array Response - 85210 Bin #5902
 $f = 200$ Hz, KB window ($\alpha = 1.5$)



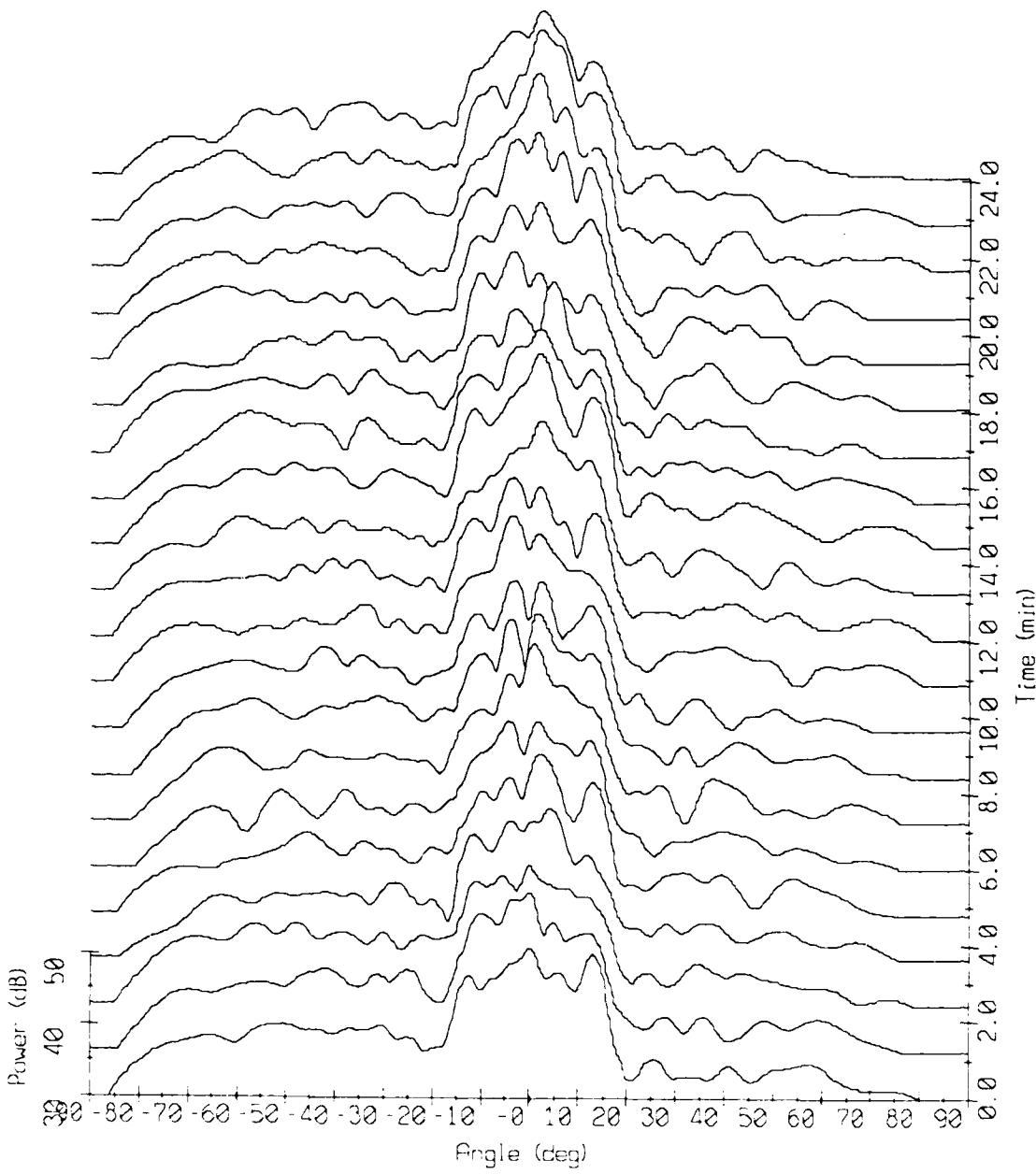
Array Response - 85010 Bin #6127
 $f = 225$ Hz, K3 window ($\alpha = 1.5$)



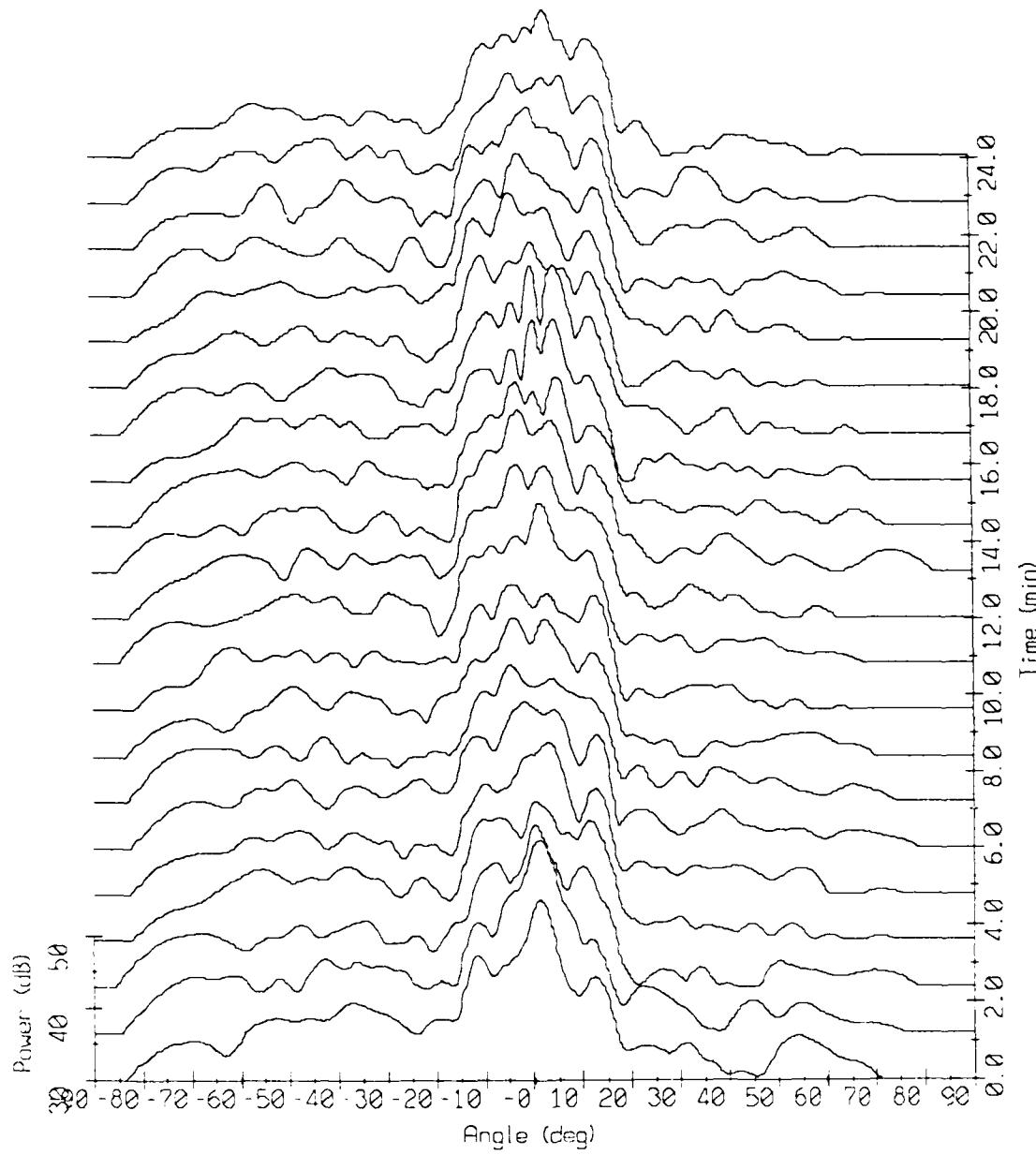
Array Response - 85010 Bin #6354
f = 252 Hz, KB window (alpha = 1.5)



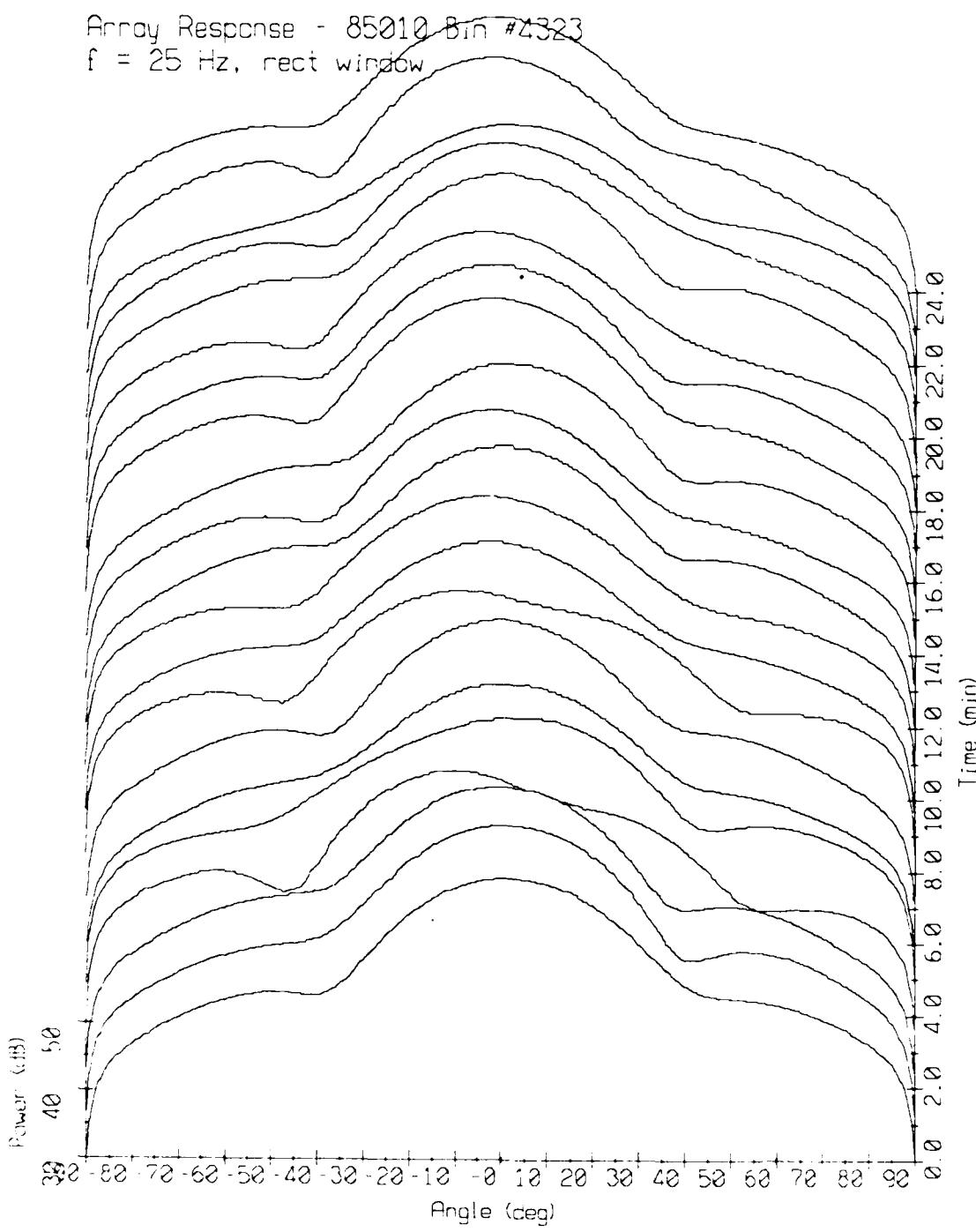
Array Response - 85010 Bin #6579
 $f = 275$ Hz, KB window ($\alpha = 1.5$)

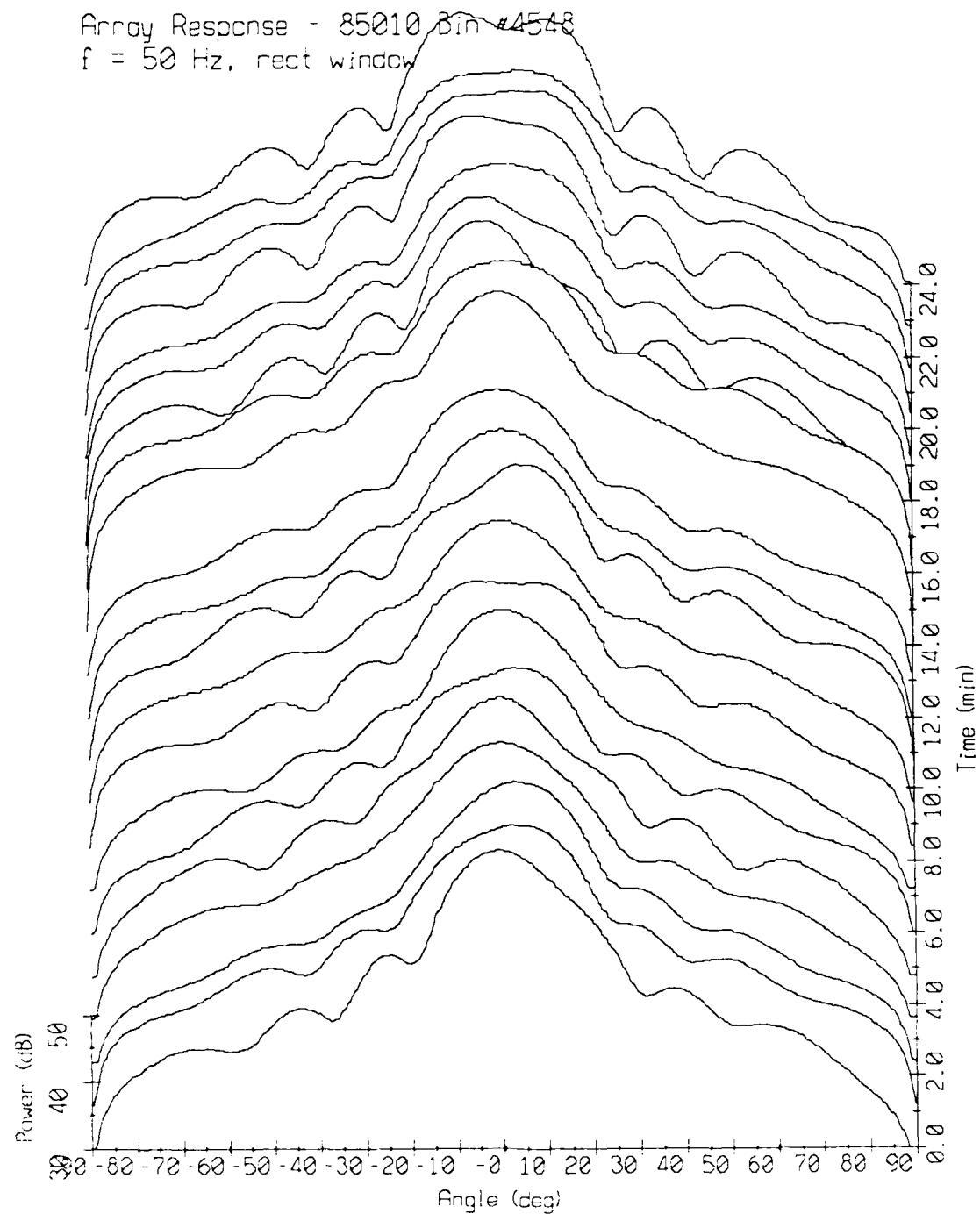


Fresnel Response - 85010 Bin #6804
 $f = 300$ Hz, K3 window ($\alpha = 1.5$)



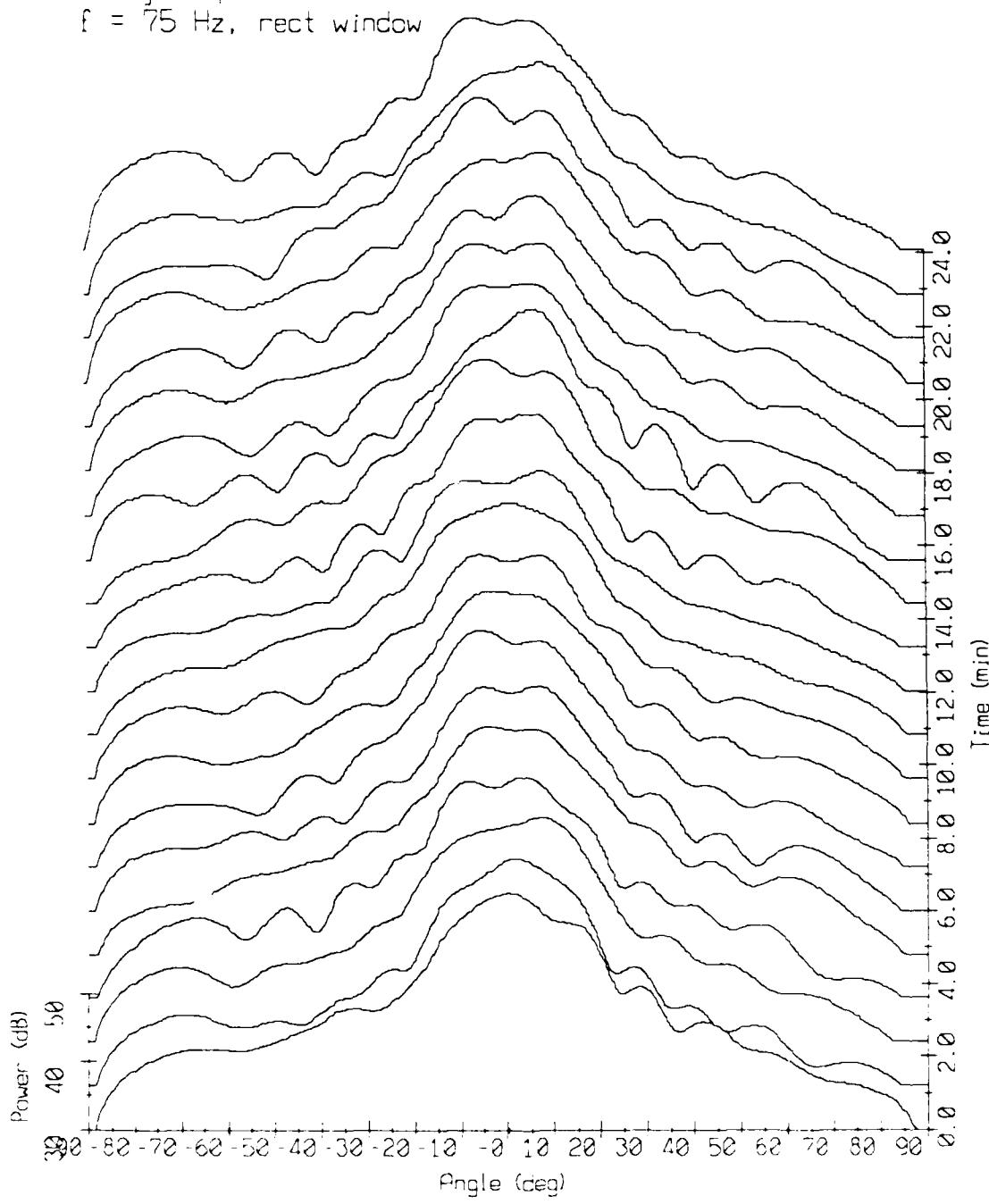
V. Array Response: Waterfall, Rect Window.



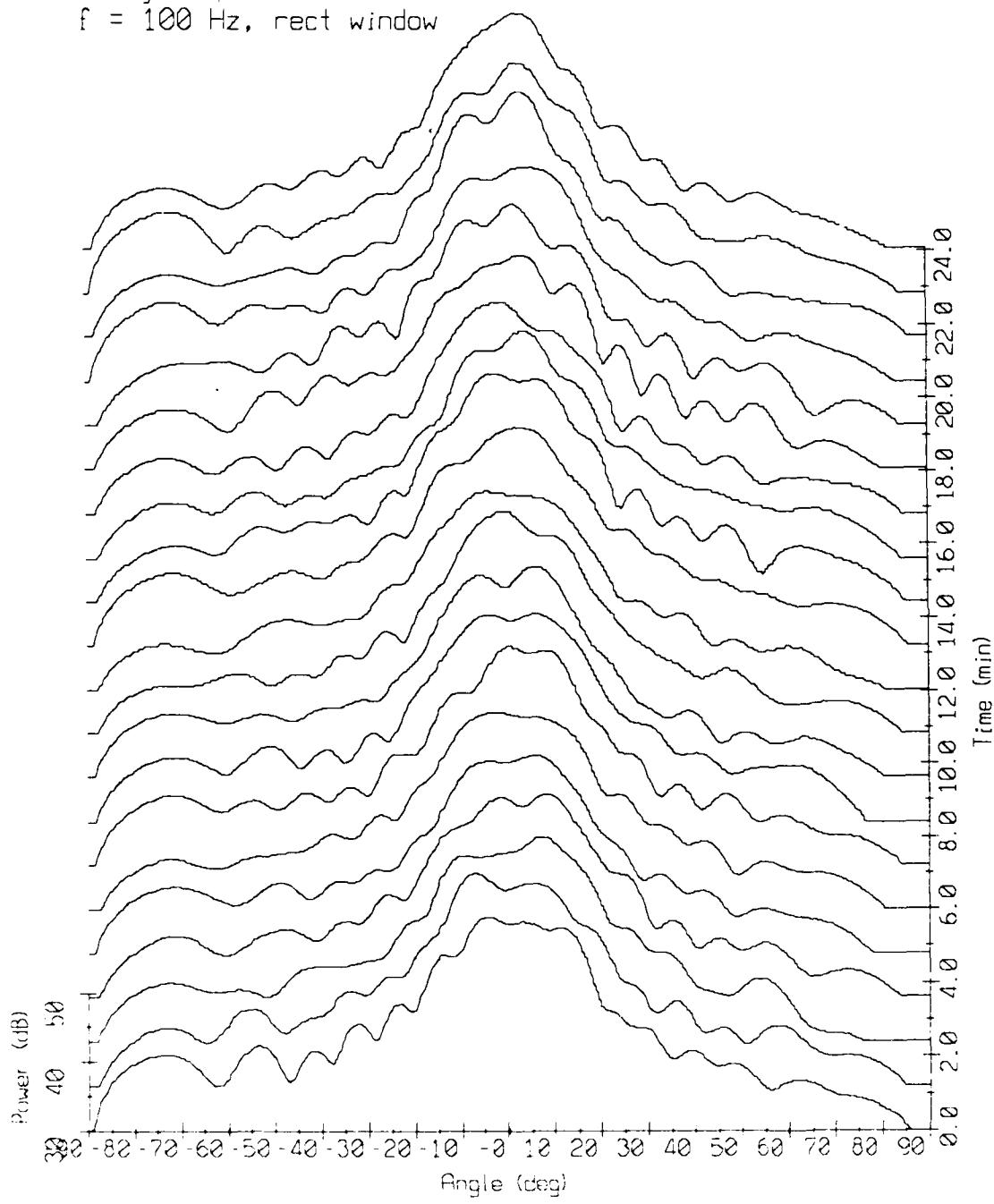


Array Response - 85010 Bin #4774

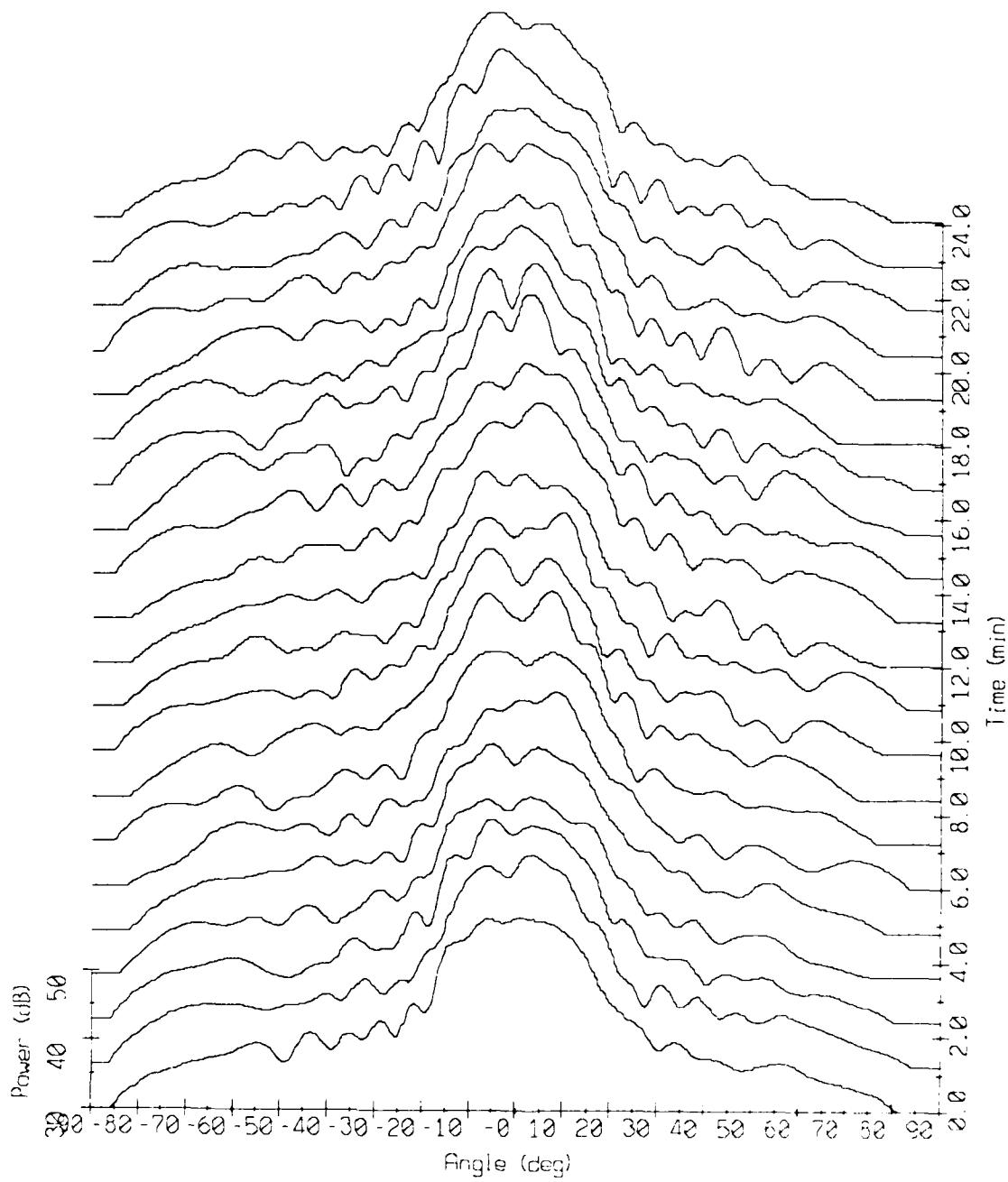
f = 75 Hz, rect window



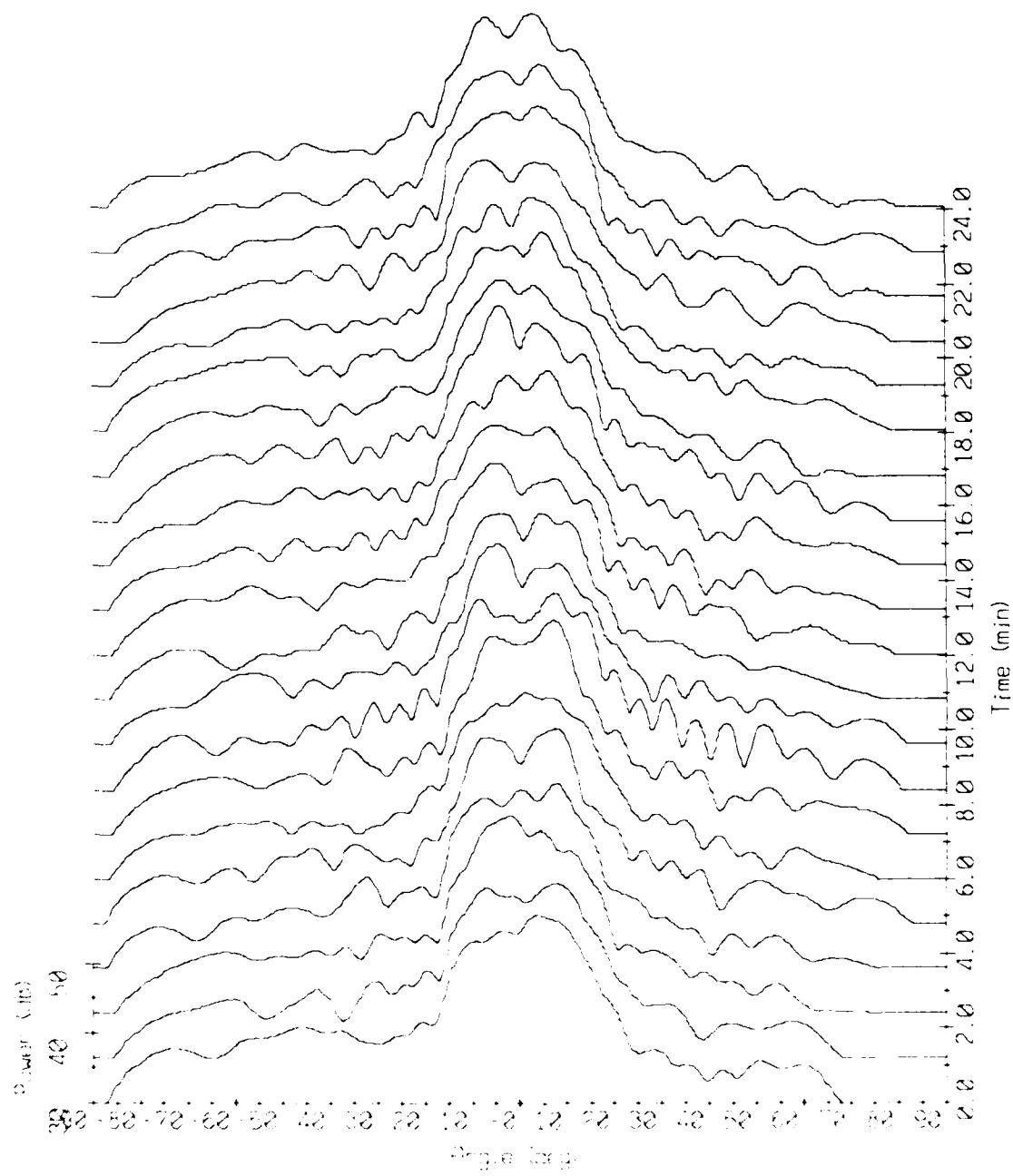
Array Response - 85010 Bin #4999
 $f = 100$ Hz, rect window



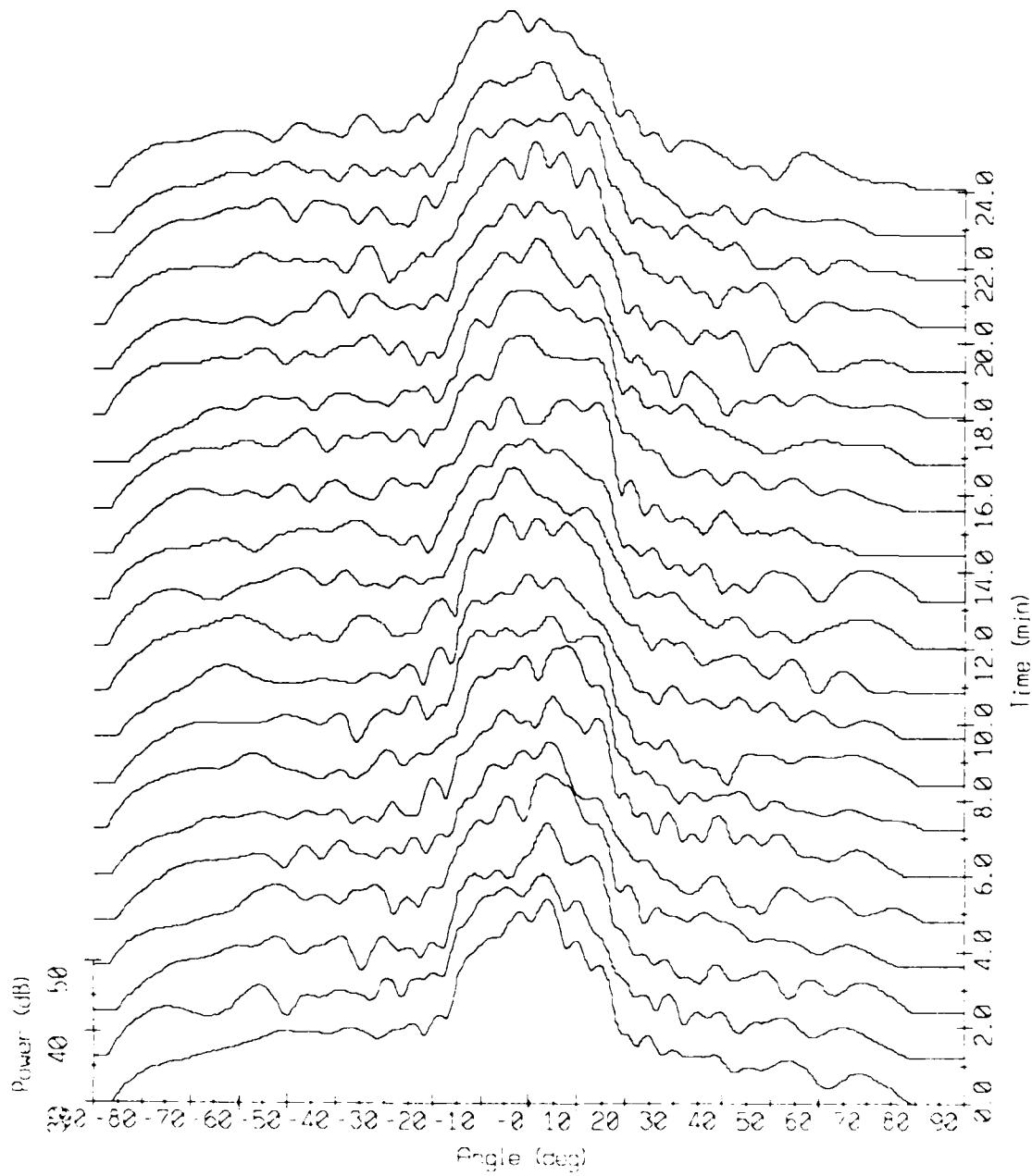
Array Response - 85010 Bin #5225
 $f = 125$ Hz, rect window



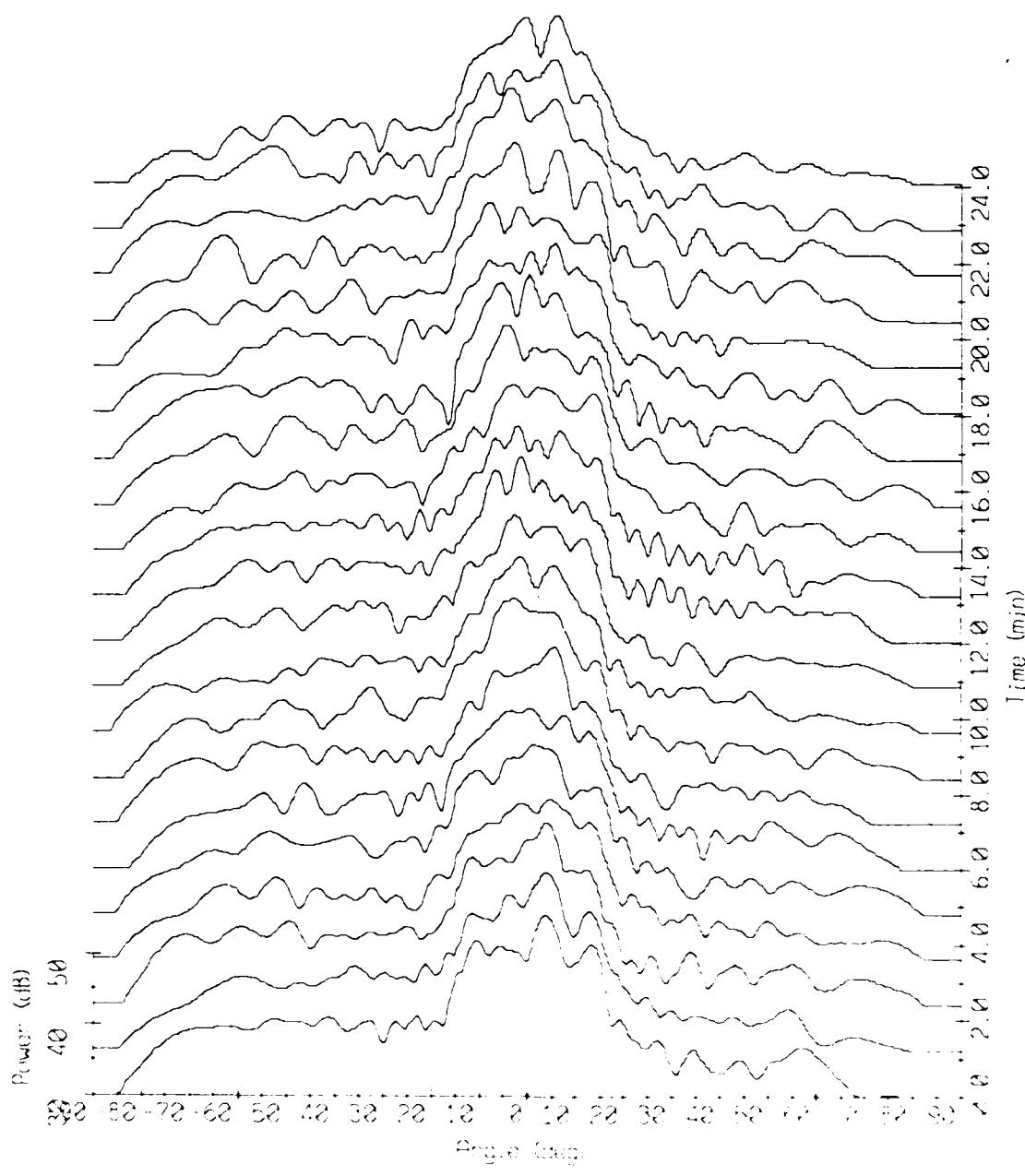
Array Response - 85010 Bin #5451
 $f = 150$ Hz, rect window



Array Response - 85010 Bin #5676
 $f = 175$ Hz, rect window

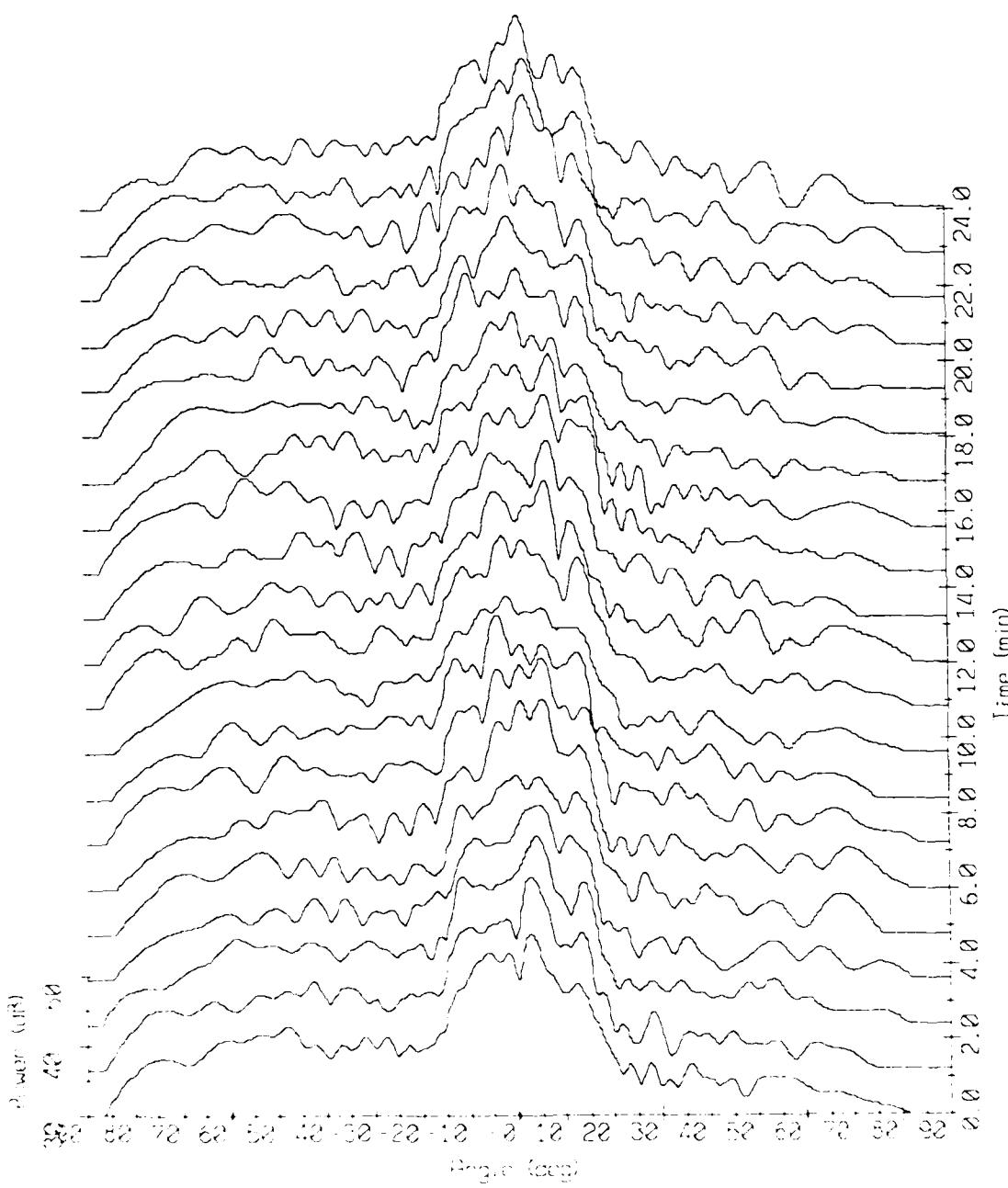


Array Response - 85010 Bin #5902
 $f = 200$ Hz, rect window

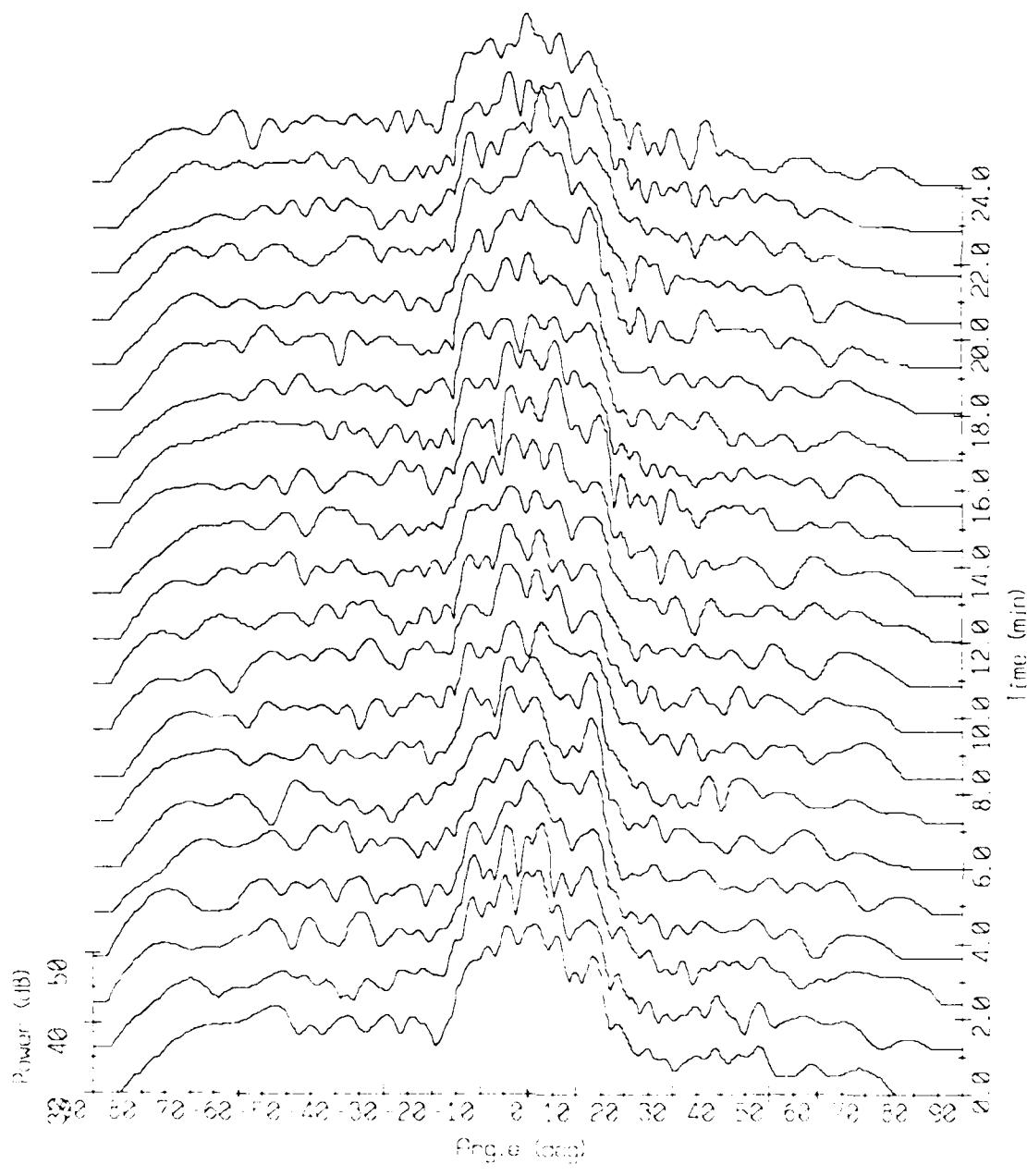


Array Response - 85010 Bin #6127

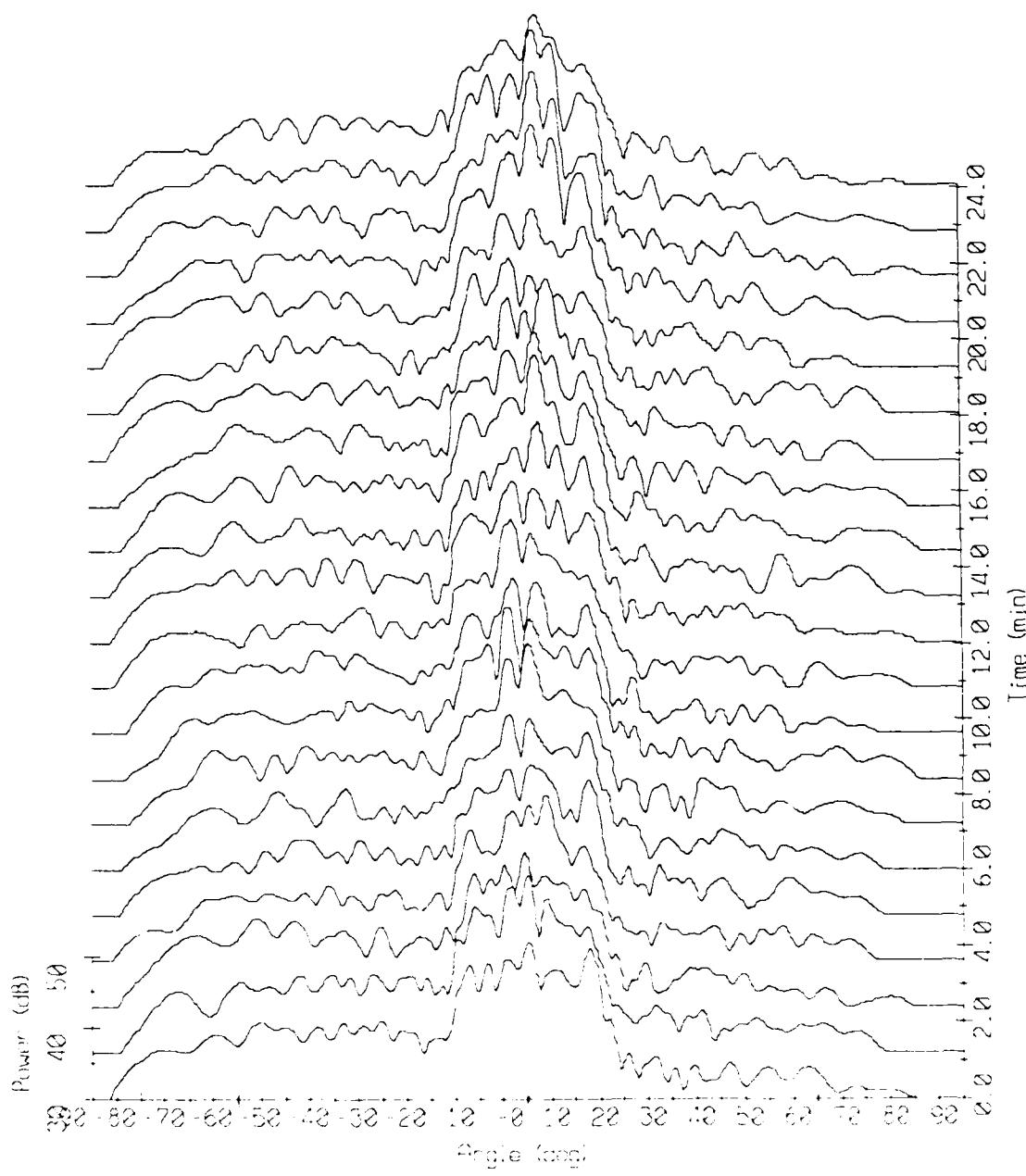
f = 225 Hz, rect window



Array Response - 85010 Bin #6354
f = 252 Hz, rect window

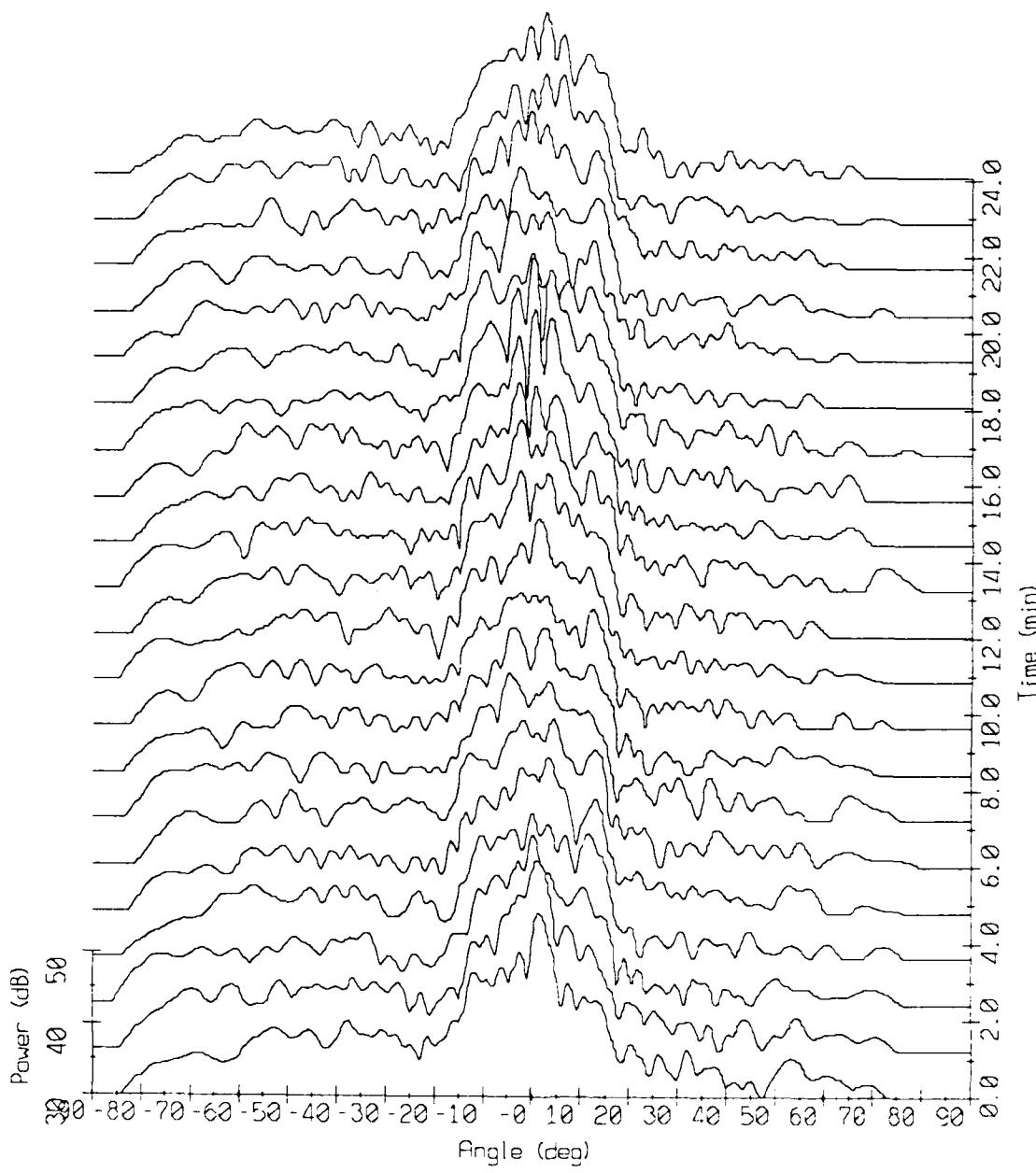


Array Response - 85010 Bin #6579
 $f = 275$ Hz, rect window



Array Response - 85010 Bin #6804

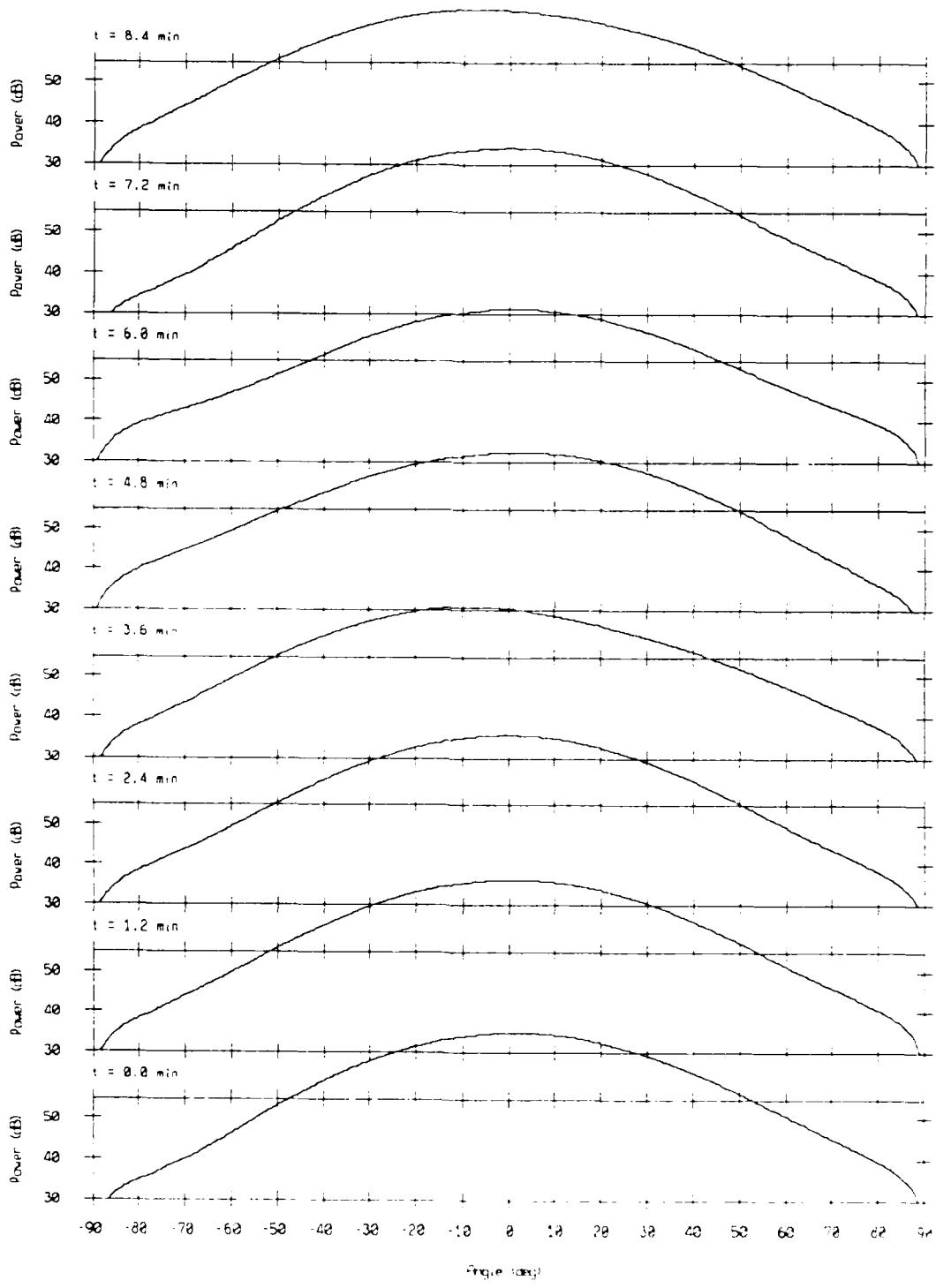
f = 300 Hz, rect window



VI. Array Response: Panels, KB Window.

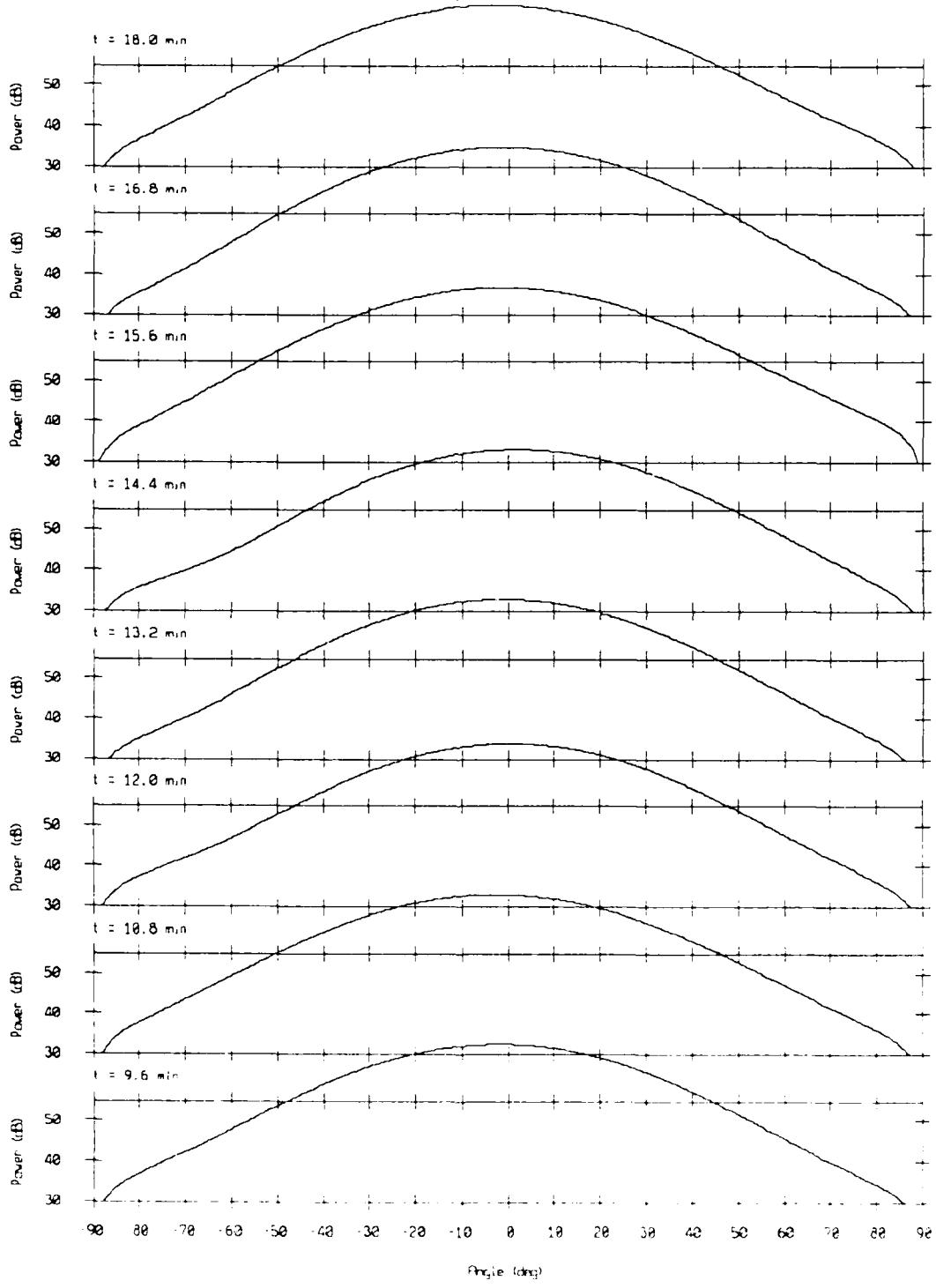
Array Response - 85010 Bin #4323

f = 25 Hz, KB window (slope = 1.5)



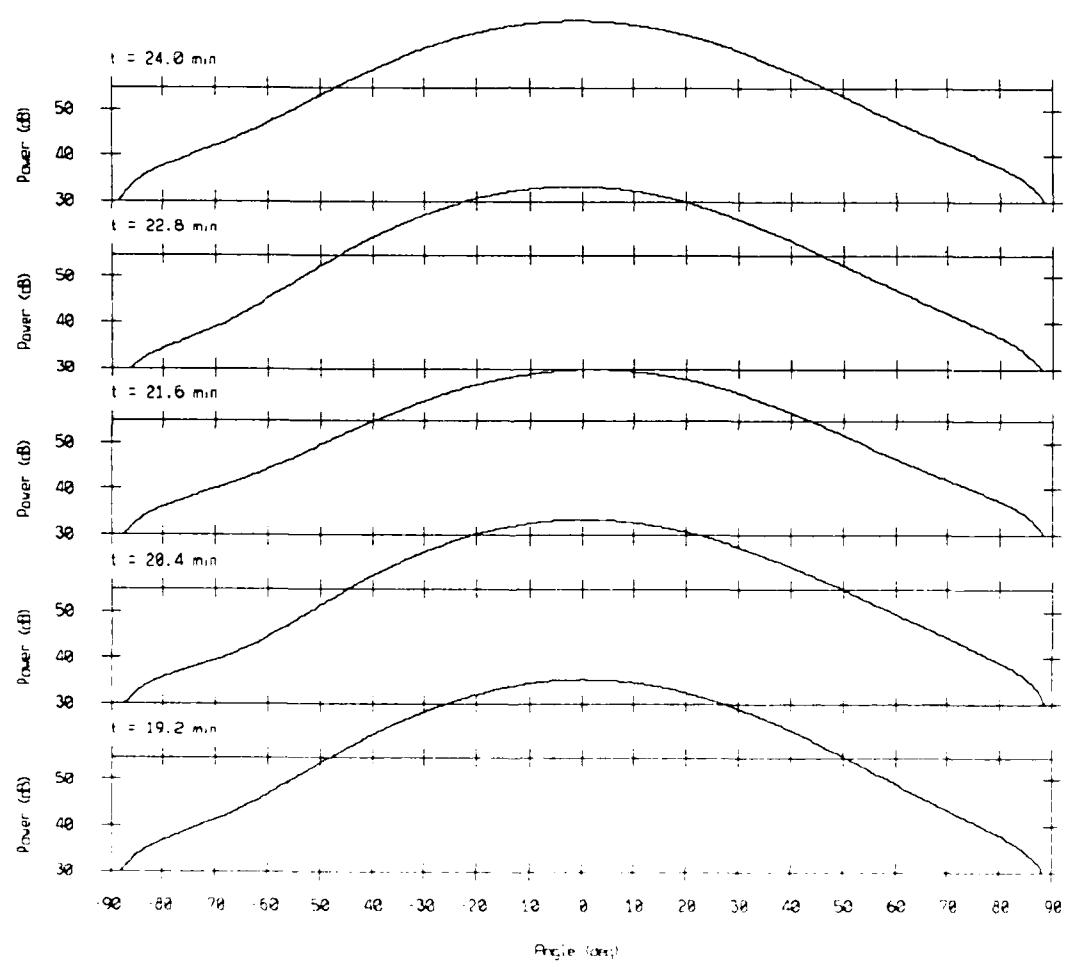
Array Response - 85010 Bin #4323

$f = 25$ Hz, KB window ($\alpha = 1.5$)



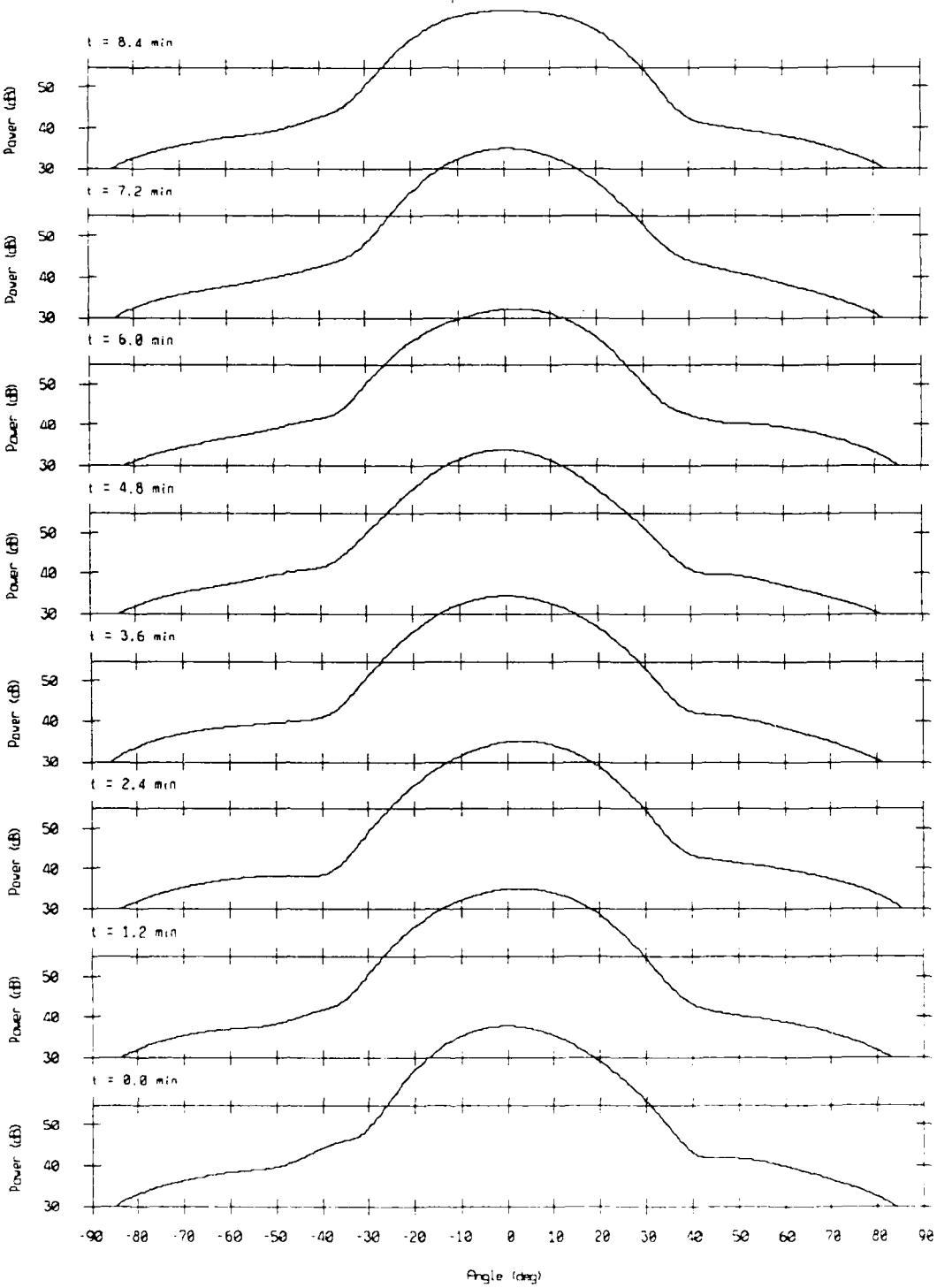
Array Response - 85010 Bin #4323

f = 25 Hz, KB window (α = 1.5)



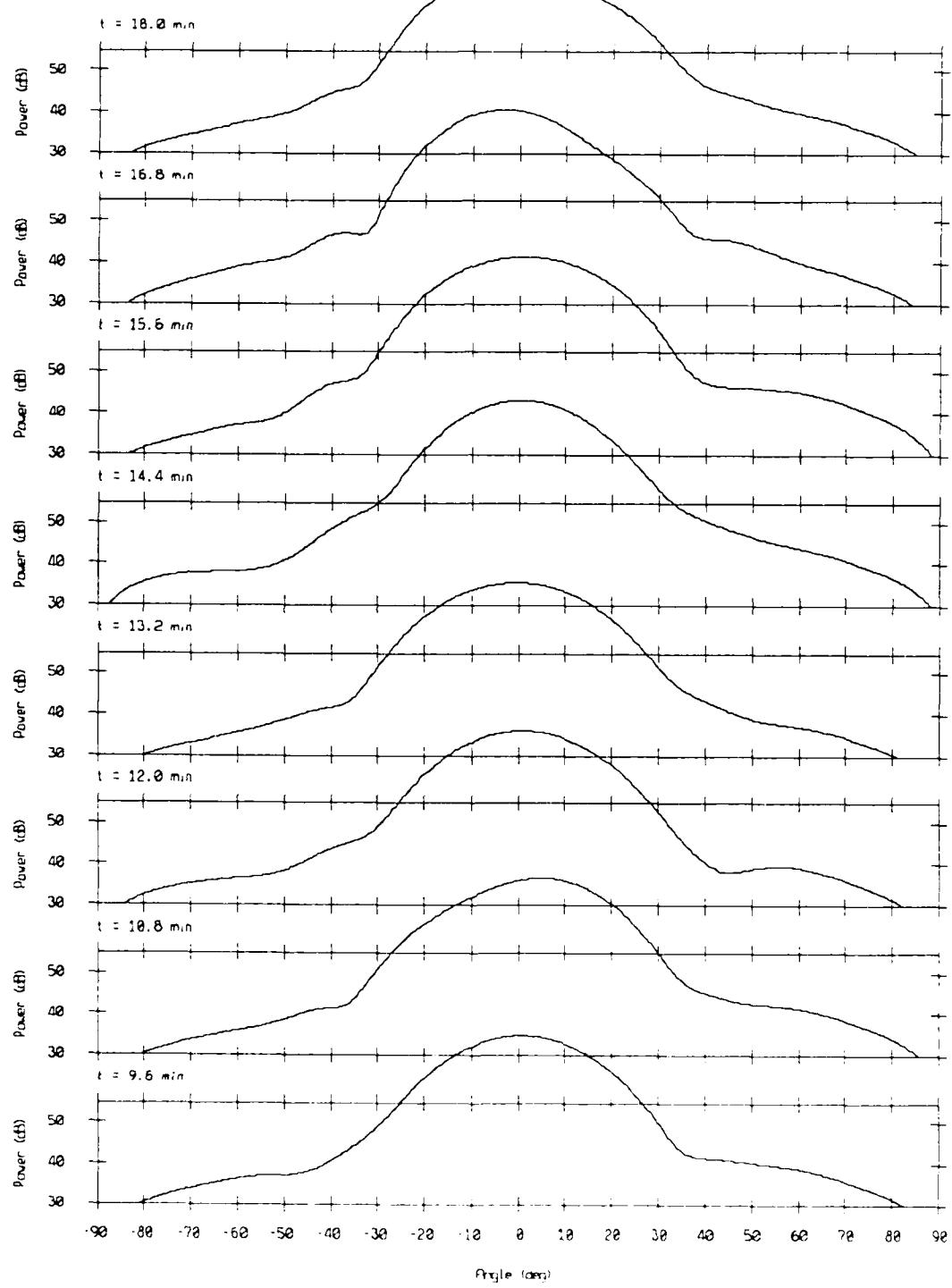
Array Response - 85010 Bin #4548

f = 50 Hz, KB window (alpha = 1.5)



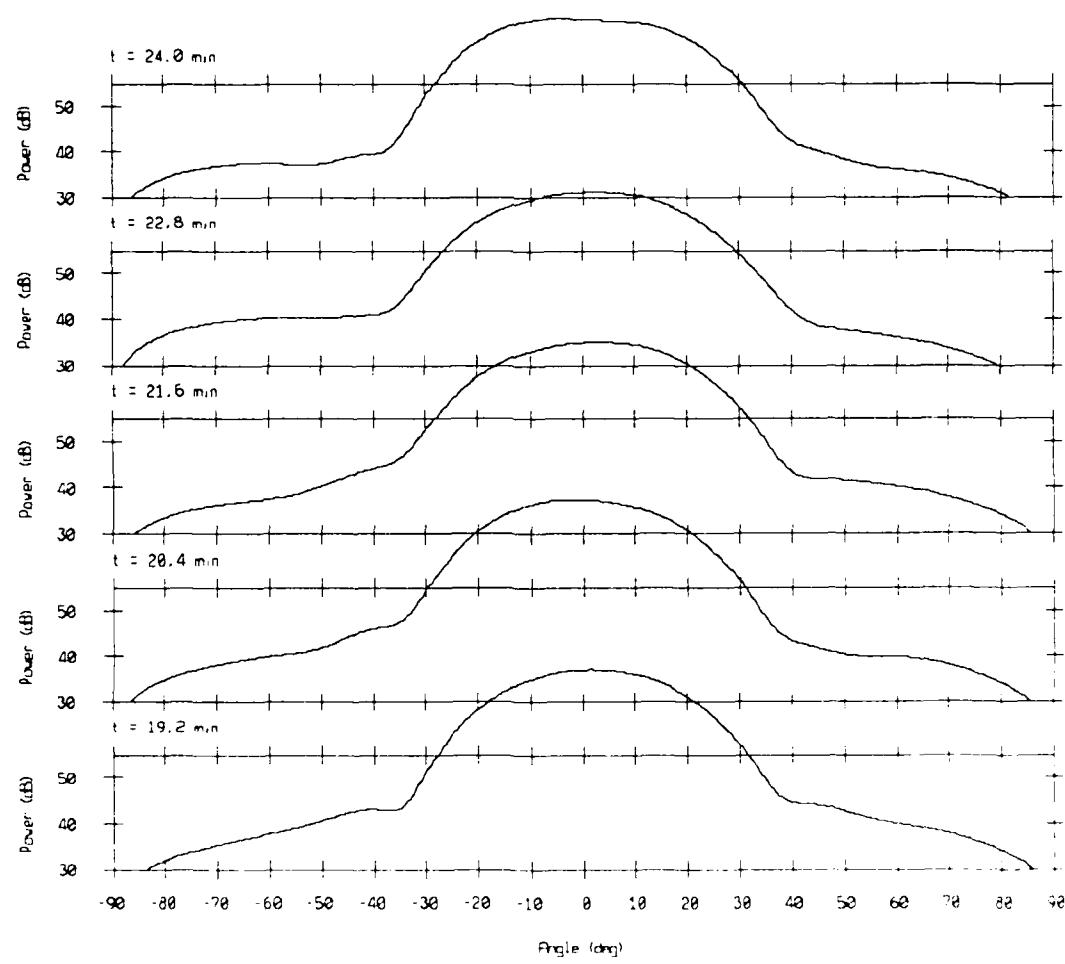
Array Response - 85010 Bin #4548

f = 50 Hz, KB window (α = 1.5)



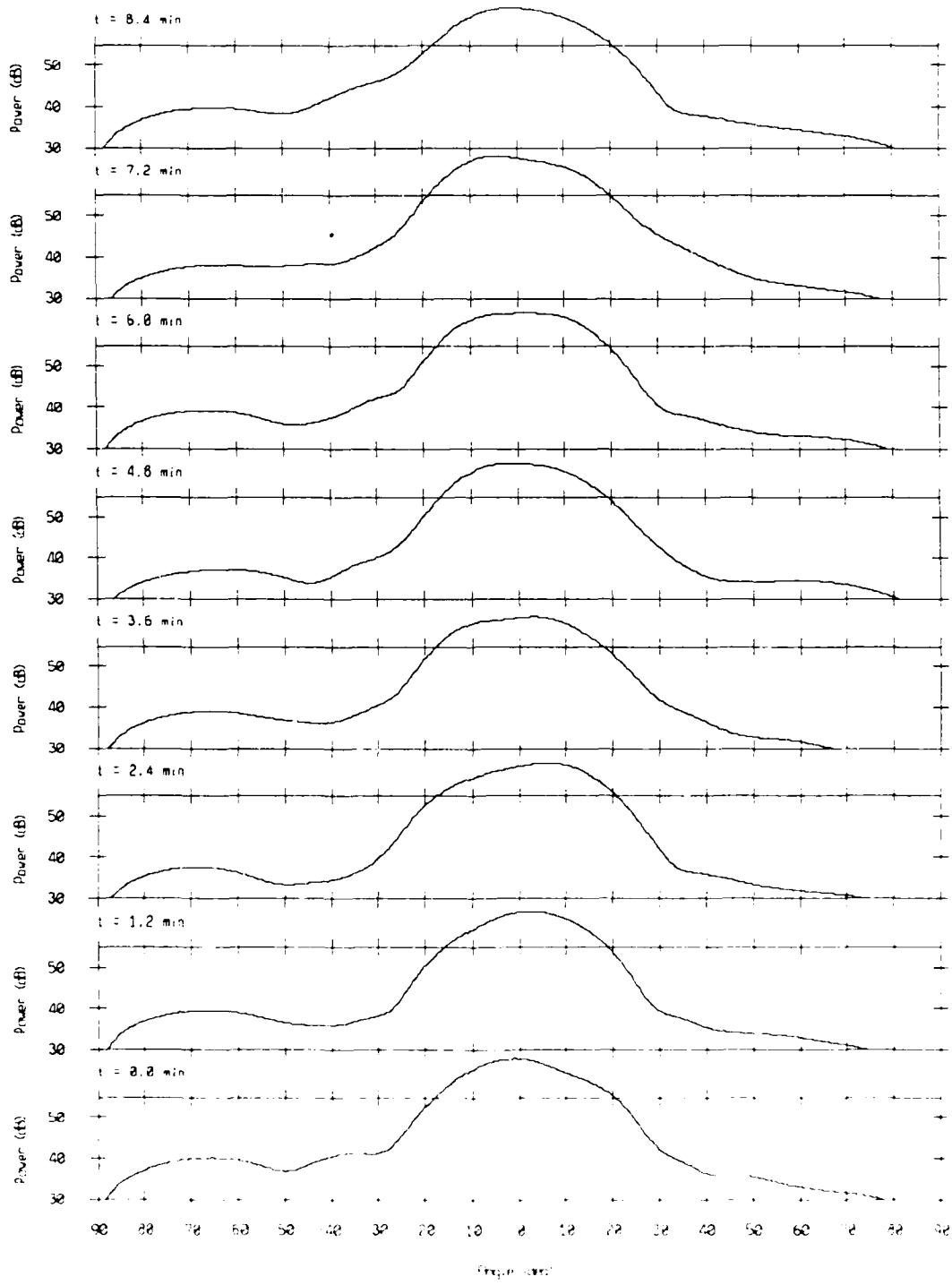
Array Response - 85010 Bin #4548

f = 50 Hz, KB window (alpha = 1.5)



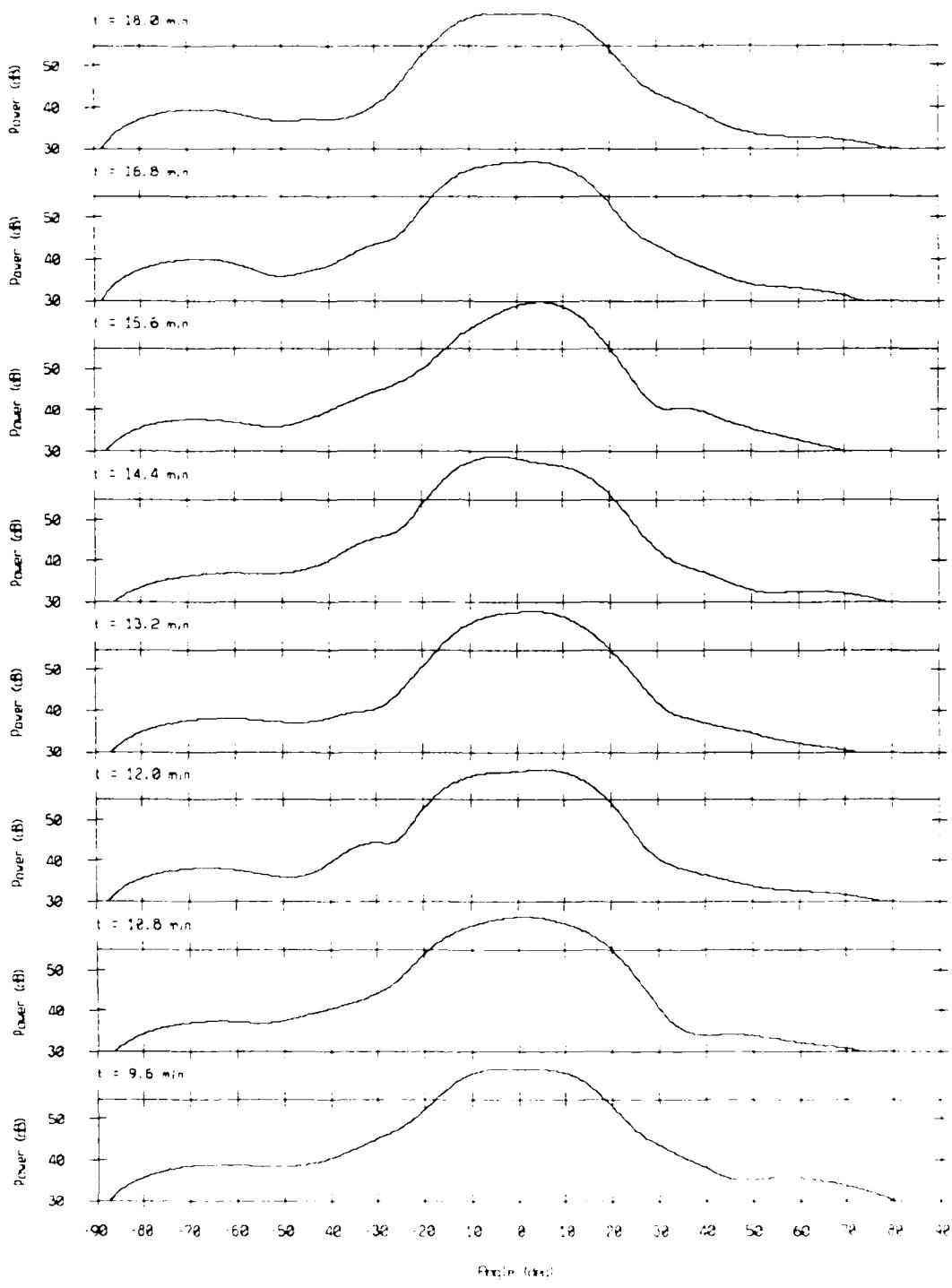
Array Response - 85012 Bin #4774

f = 75 Hz, KB window (elpro = 1.5)



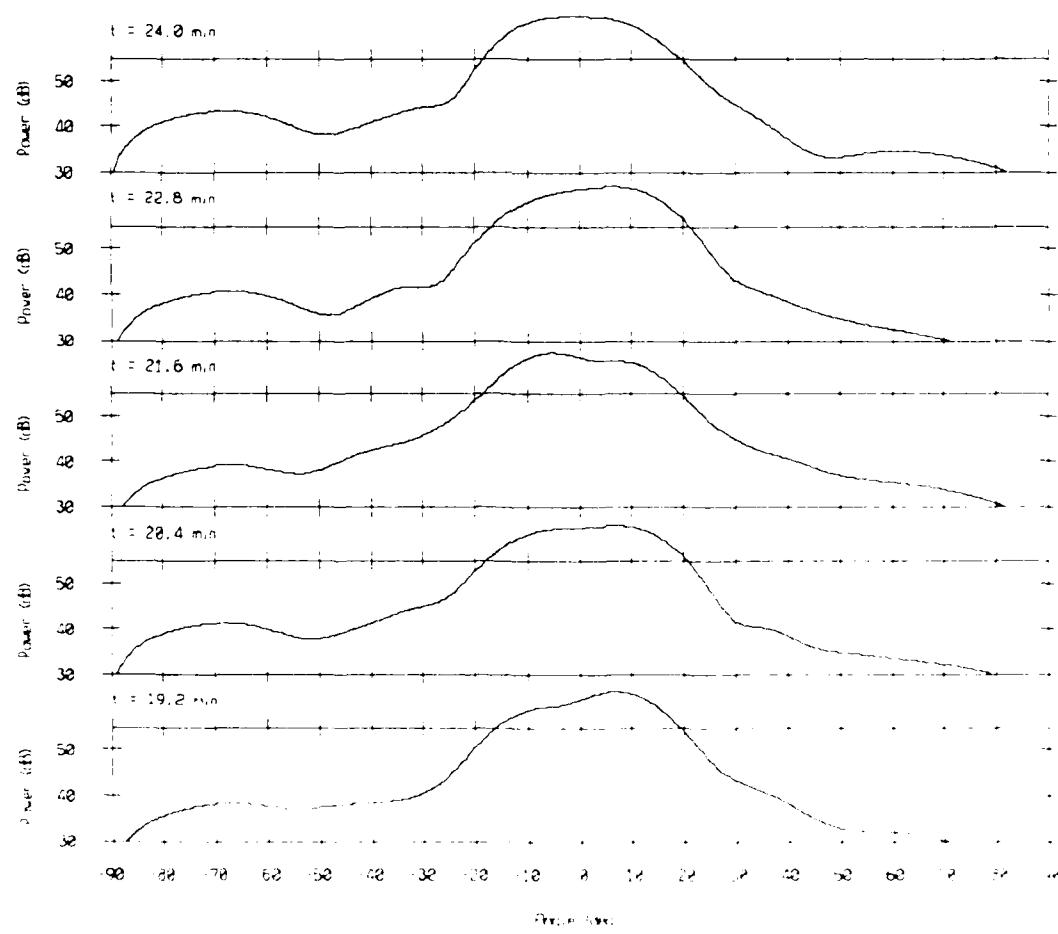
Arcs₃ Response - 85212 31-#4774

f = 75 Hz, $\times 5$ window (discr = 1.5)



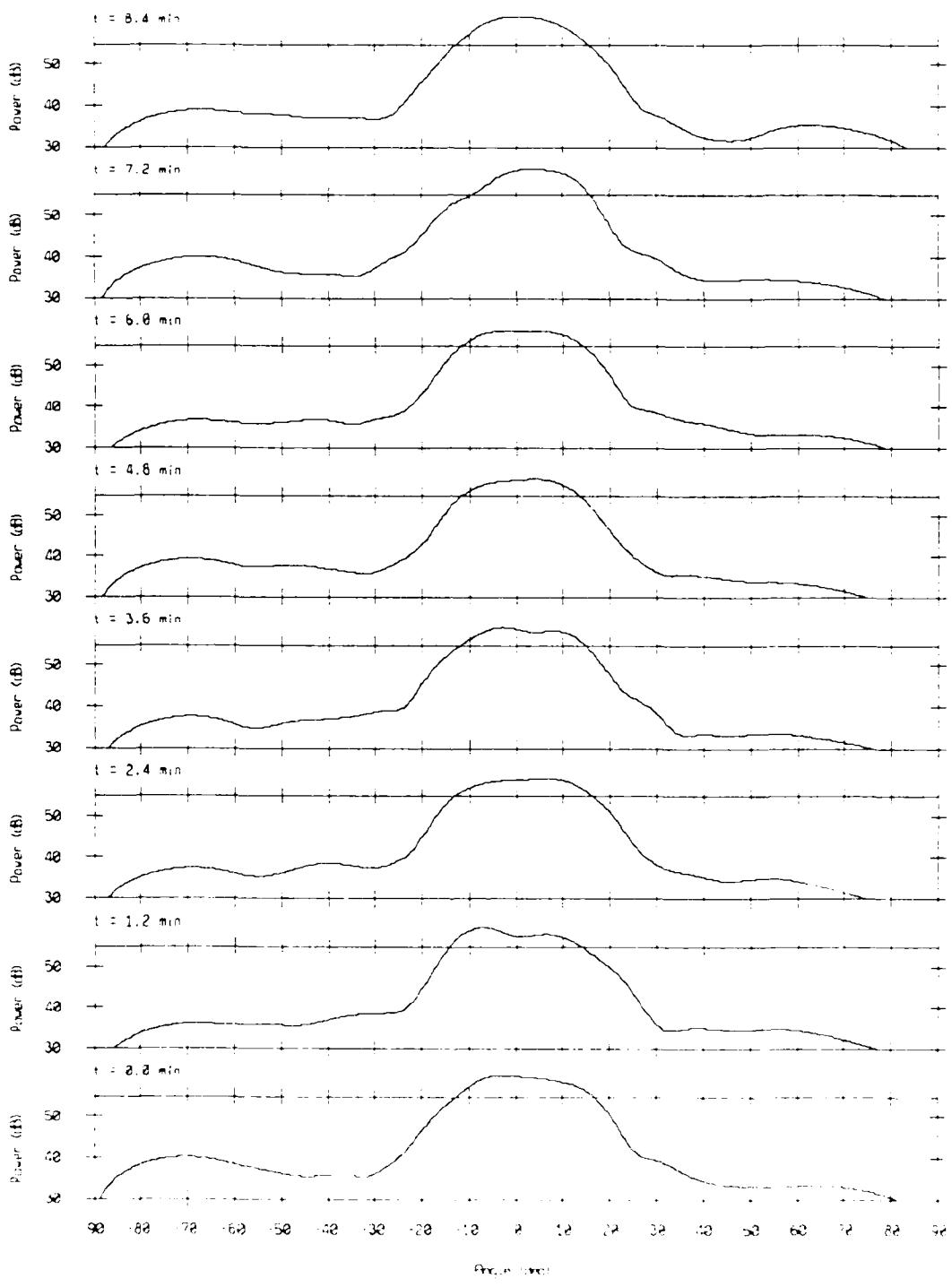
Freq. Response = 85212.315 #L774

f = 75 Hz, 15 window (filter = 1.5)



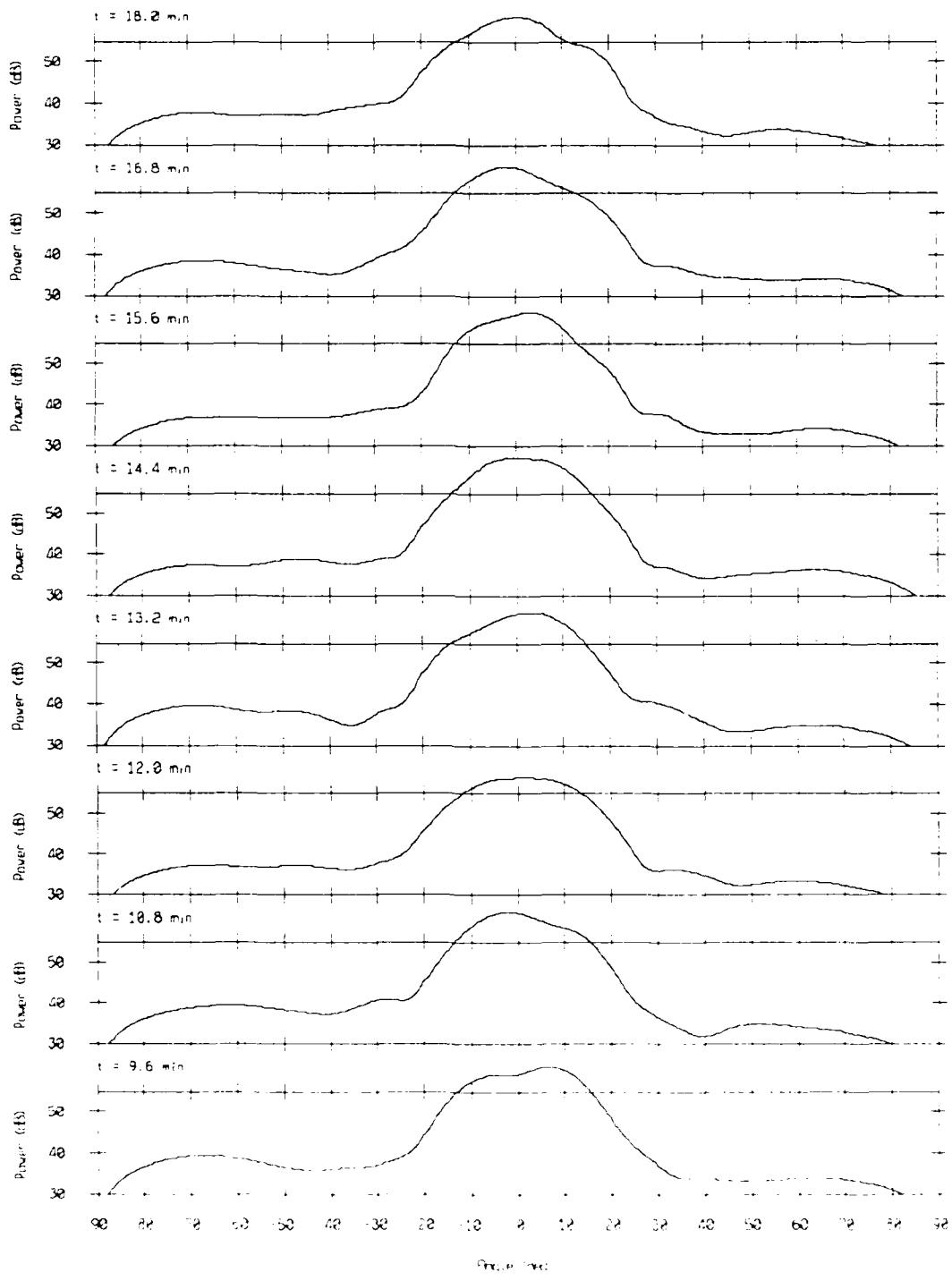
Fancy Response - 85010 Blr #4999

f = 122 Hz, KB window (c)pre = 1.5

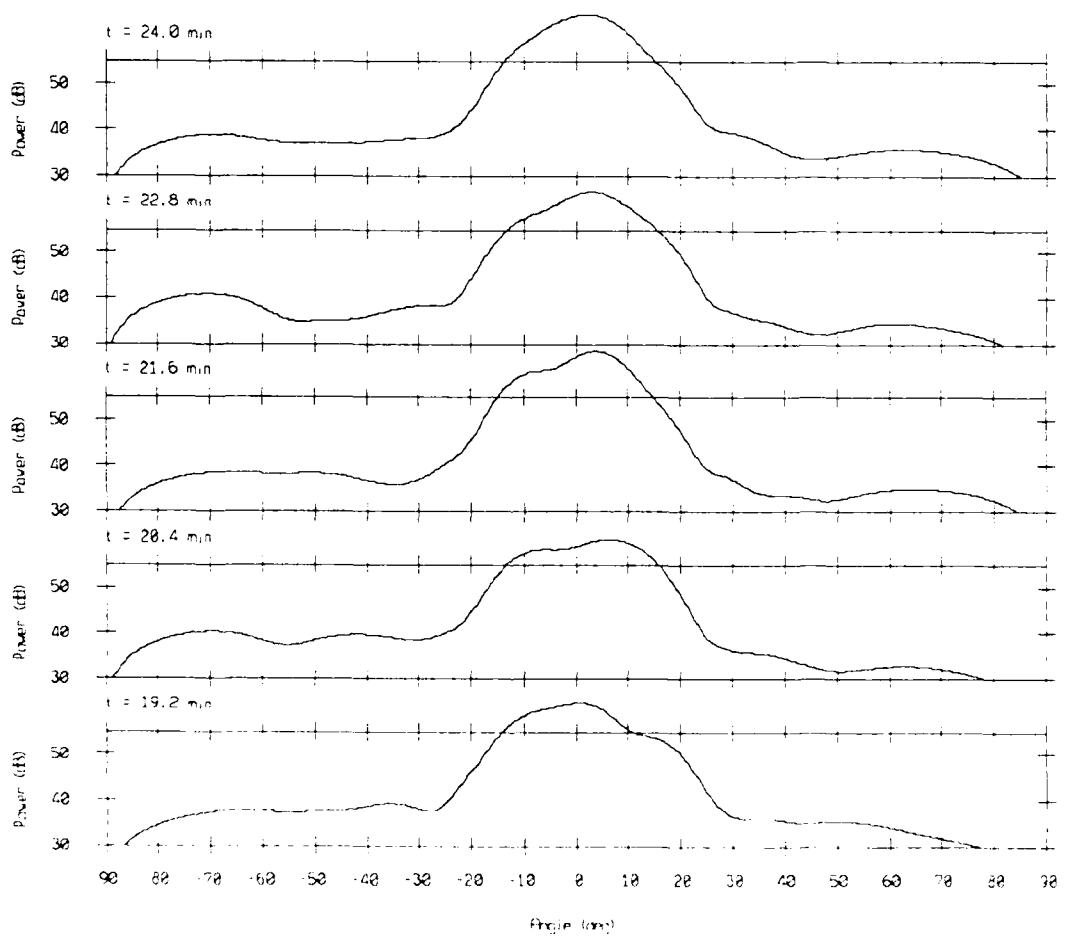


Array Response - 85010 Bin #4999

$f = 100$ Hz, KB window ($\alpha/\rho = 1.5$)

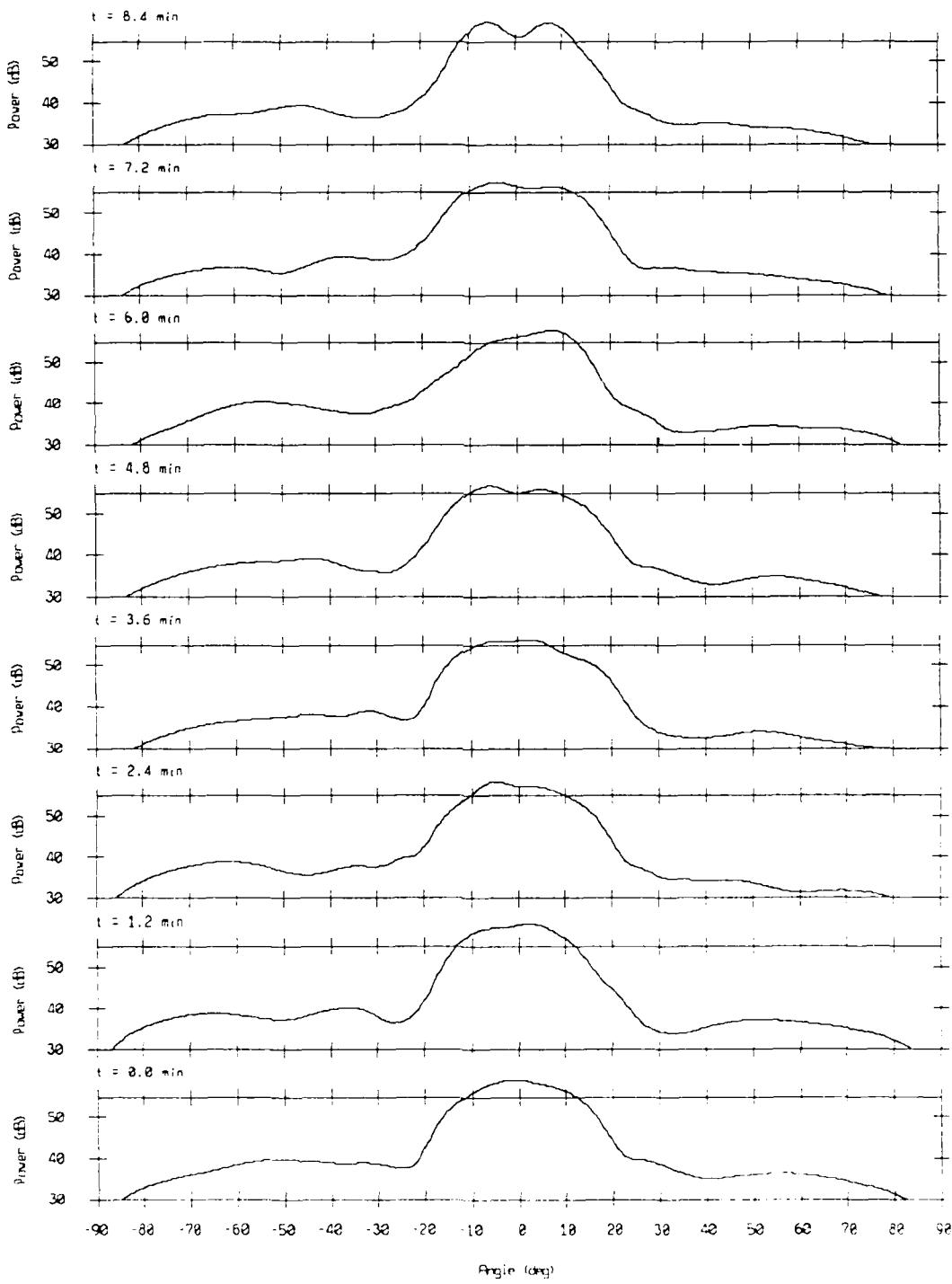


Array Response - 85012 Bin #4999
 $f = 102$ Hz, KB window (slope = 1.5)



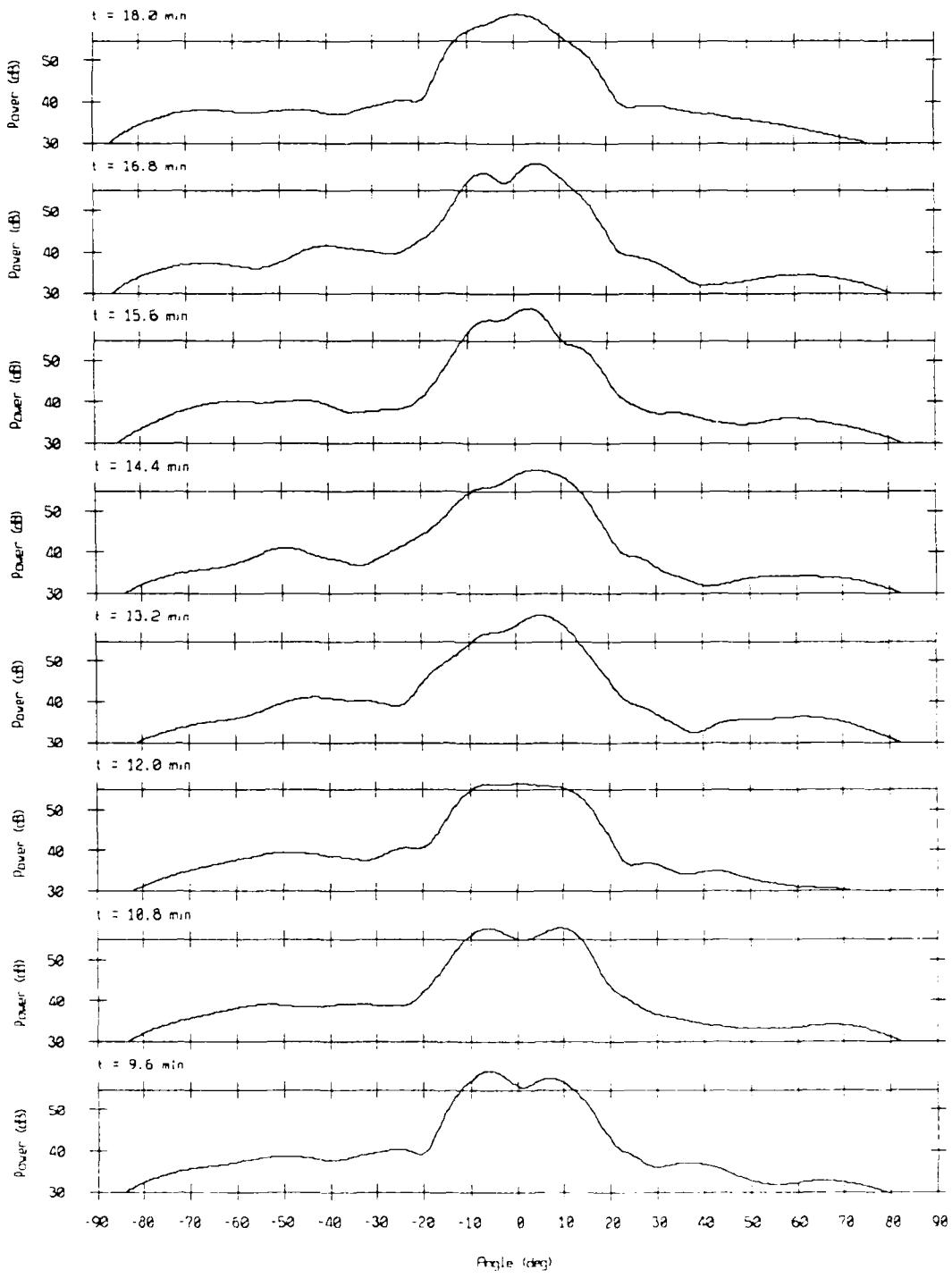
Array Response - 85010 Bin #5225

$f = 125$ Hz, KB window (α = 1.5)



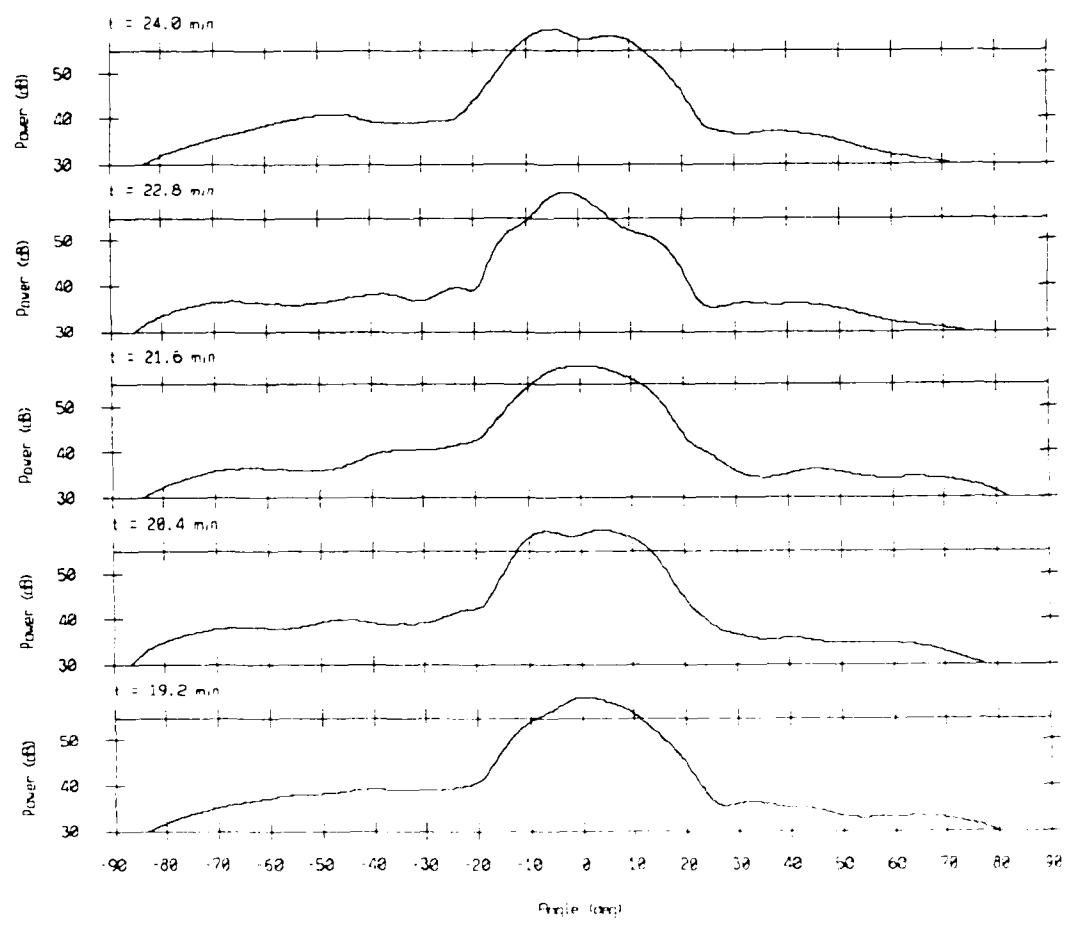
Array Response - 85010 Bin #5225

f = 125 Hz, KB window (α = 1.5)

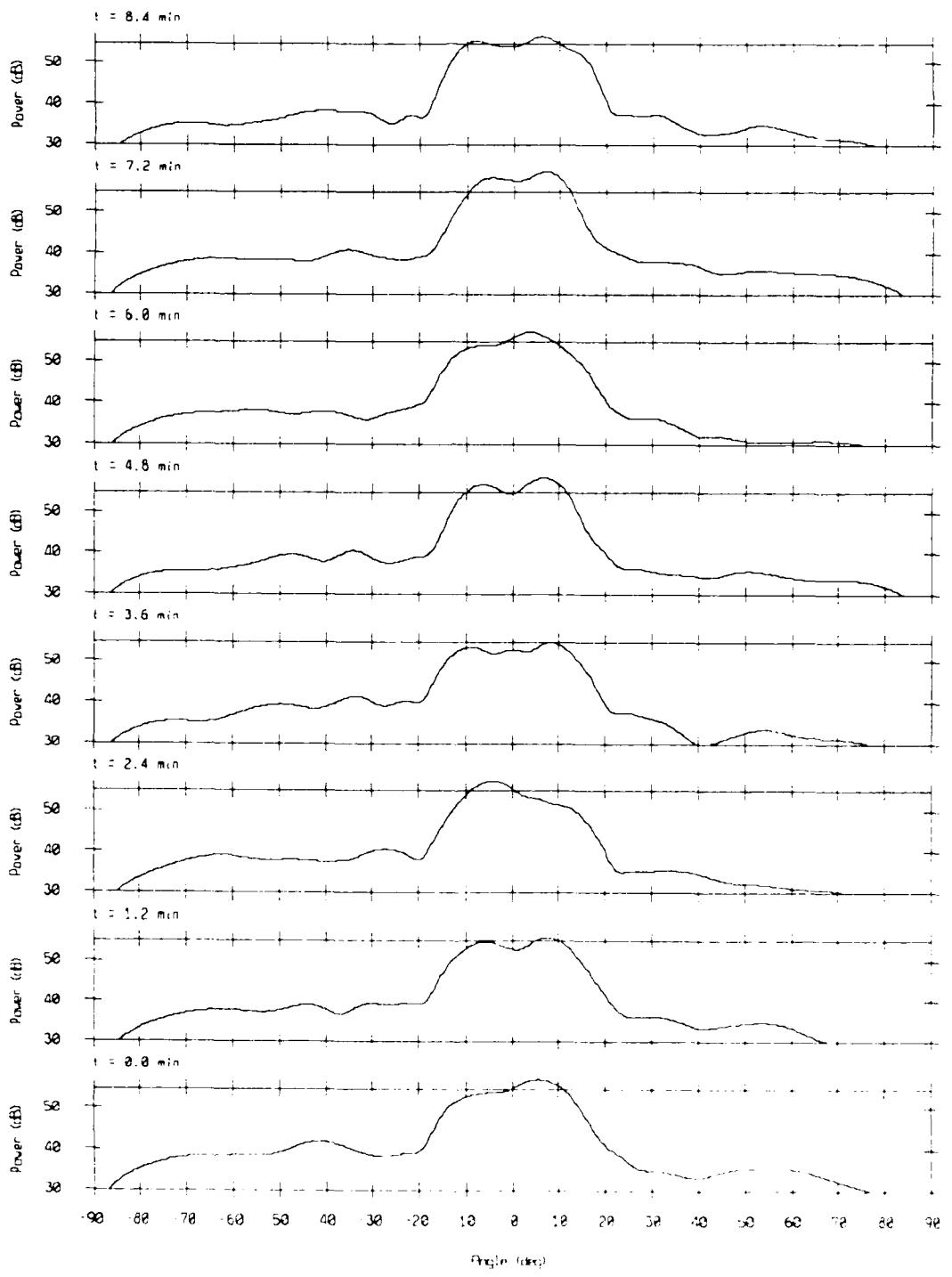


Array Response - 85010 Bin #5225

f = 125 Hz, KB window (cicro = 1.5)

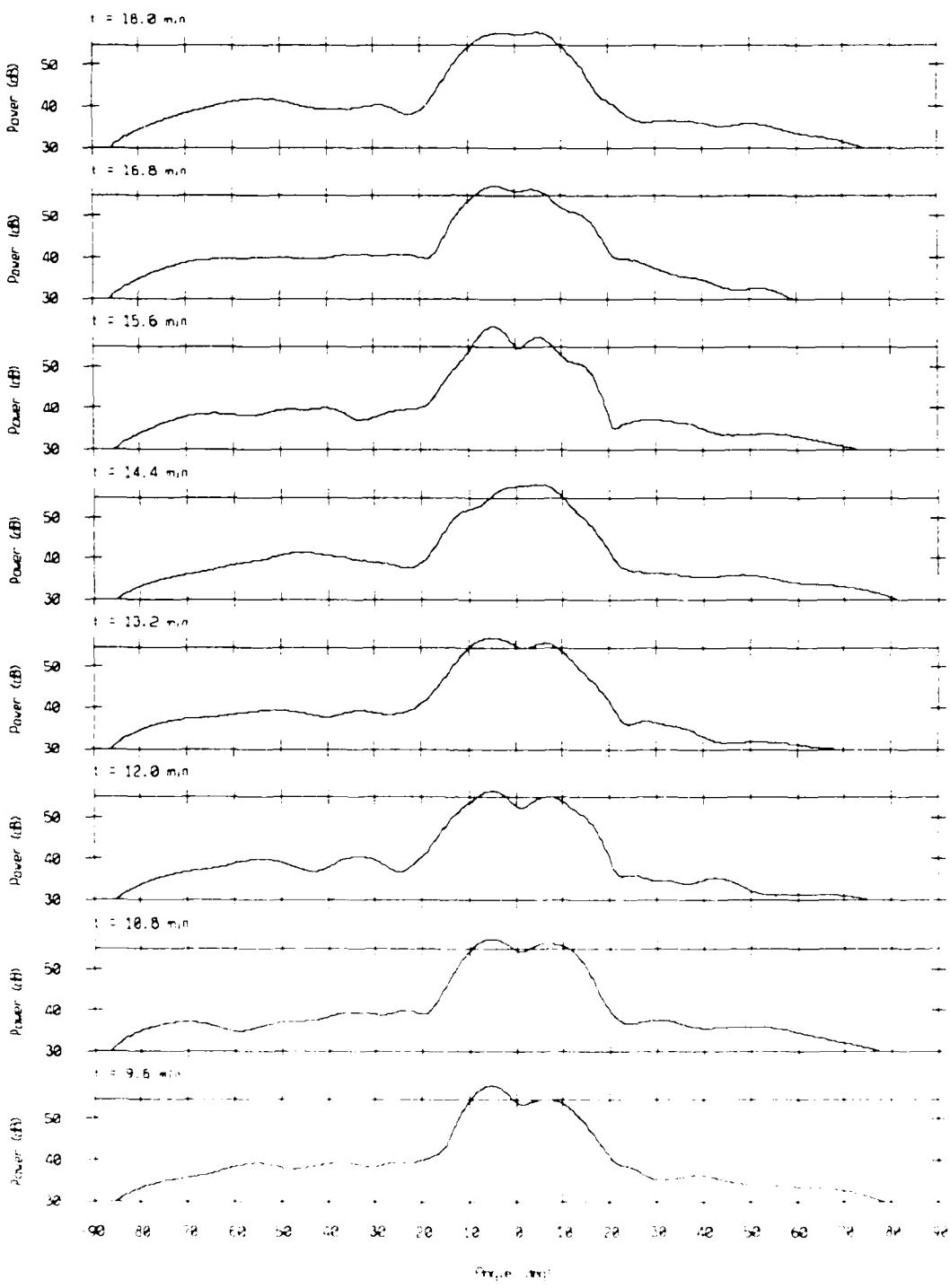


Array Response - 85010 Bin #5451
 $f = 150$ Hz, KB window ($\alpha_{phc} = 1.5$)



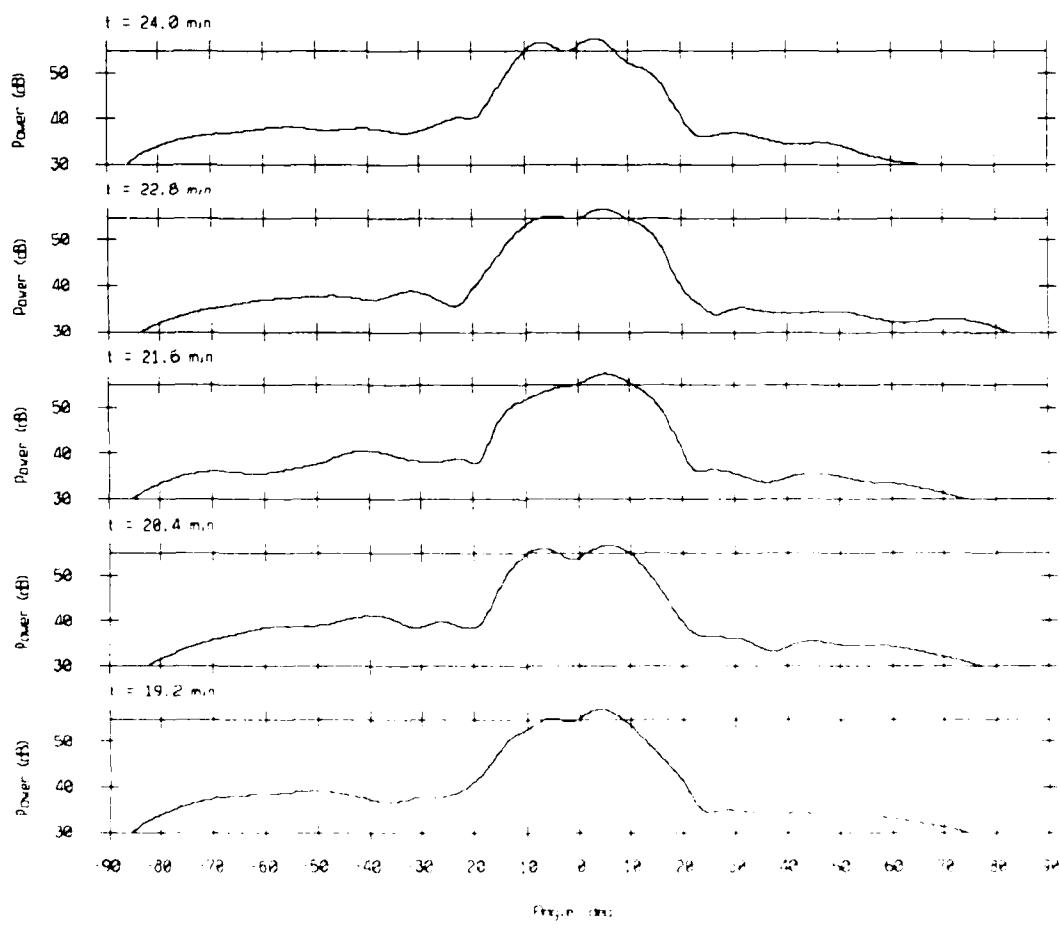
Array Response - 85010 Bin #5451

f = 150 Hz, KB window (alpha = 1.5)



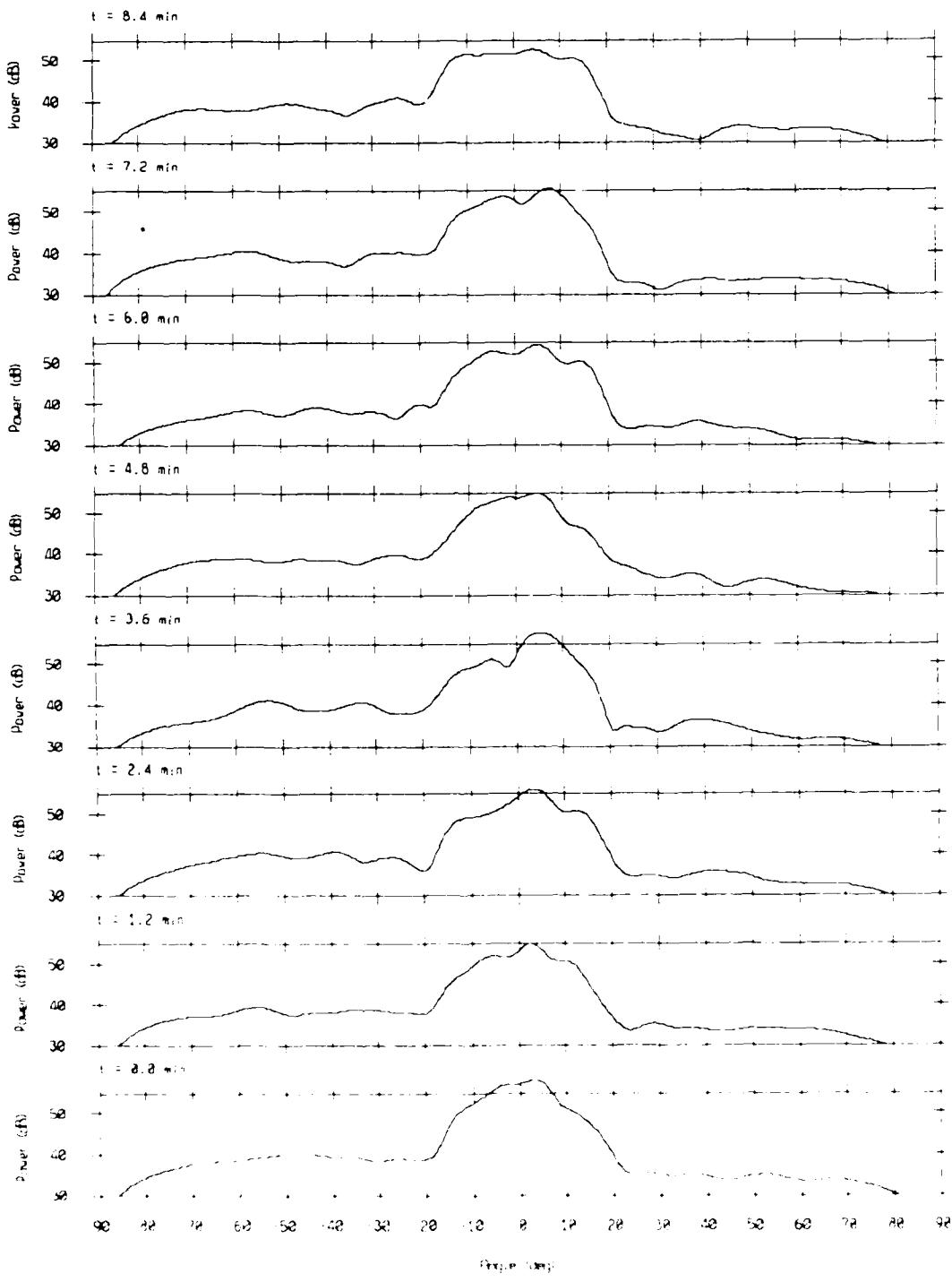
Array Response - 85010 Bin #5451

f = 150 Hz, KB window (alpha = 1.5)



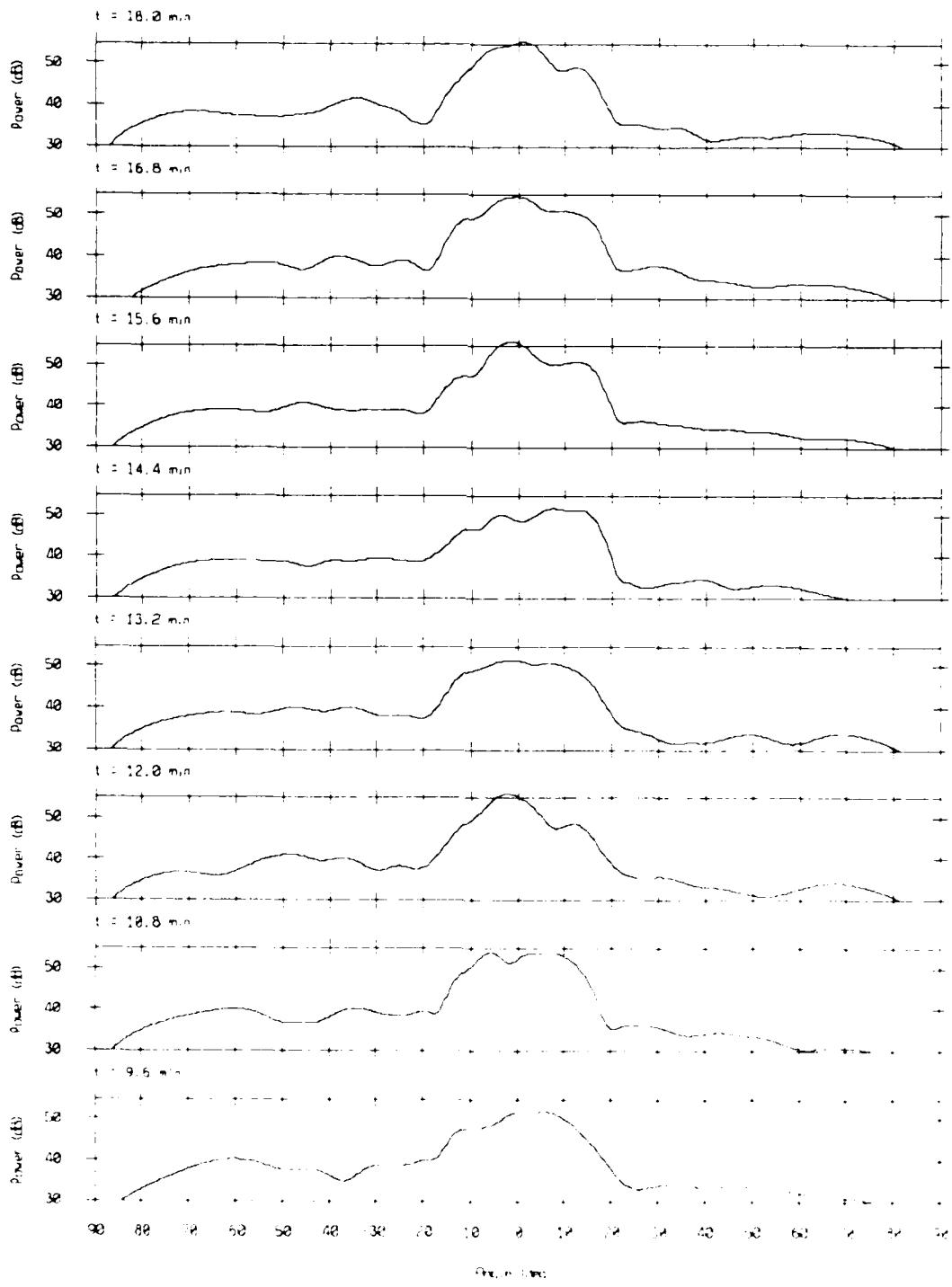
Array Response - 85010 Bin #5676

f = 175 Hz, KB window (α = 1.5)

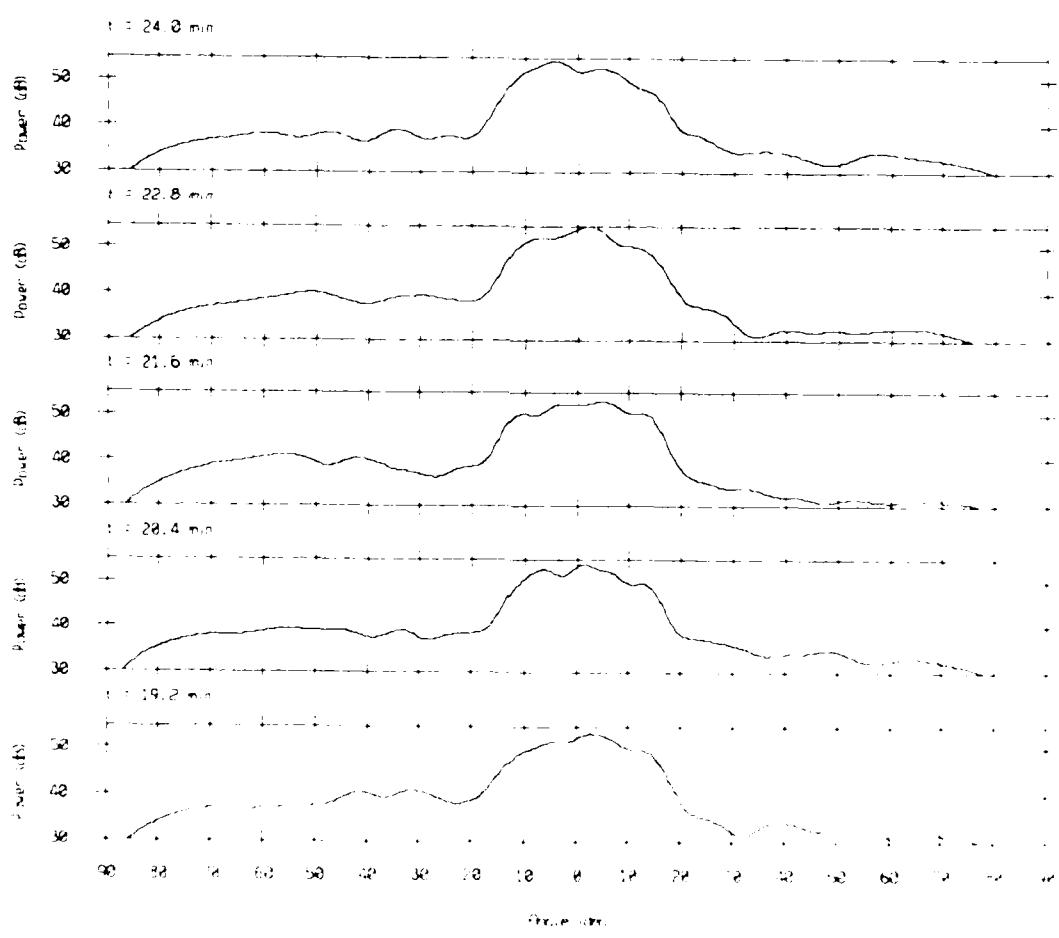


Array Response - 85010 Bin #5676

f = 175 Hz, KB window ($\alpha_{pre} = 1.5$)

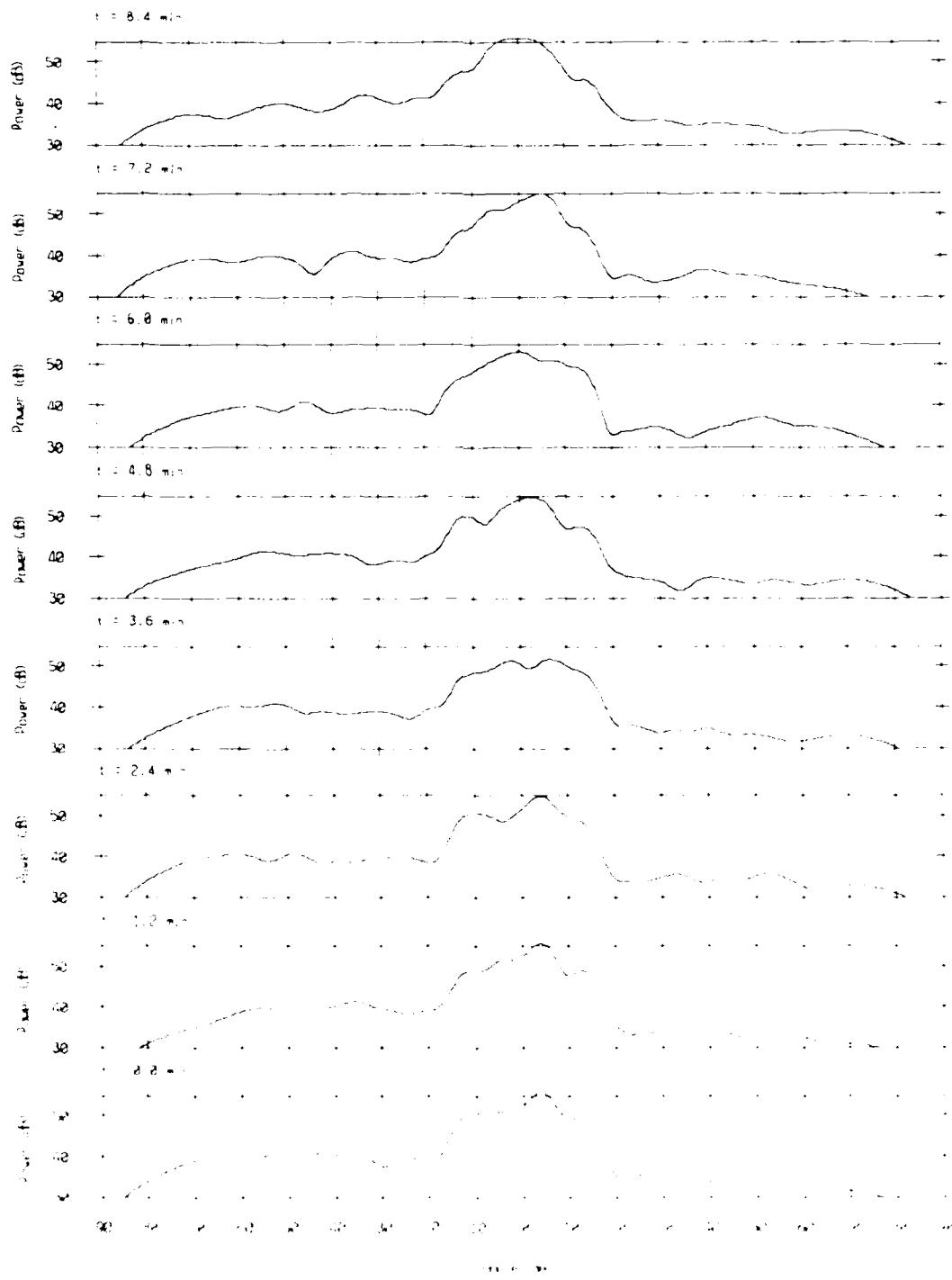


Fancy Response - 85012 Bin #5675
f = 175 Hz, $\times 8$ window (cycles = 1.5)



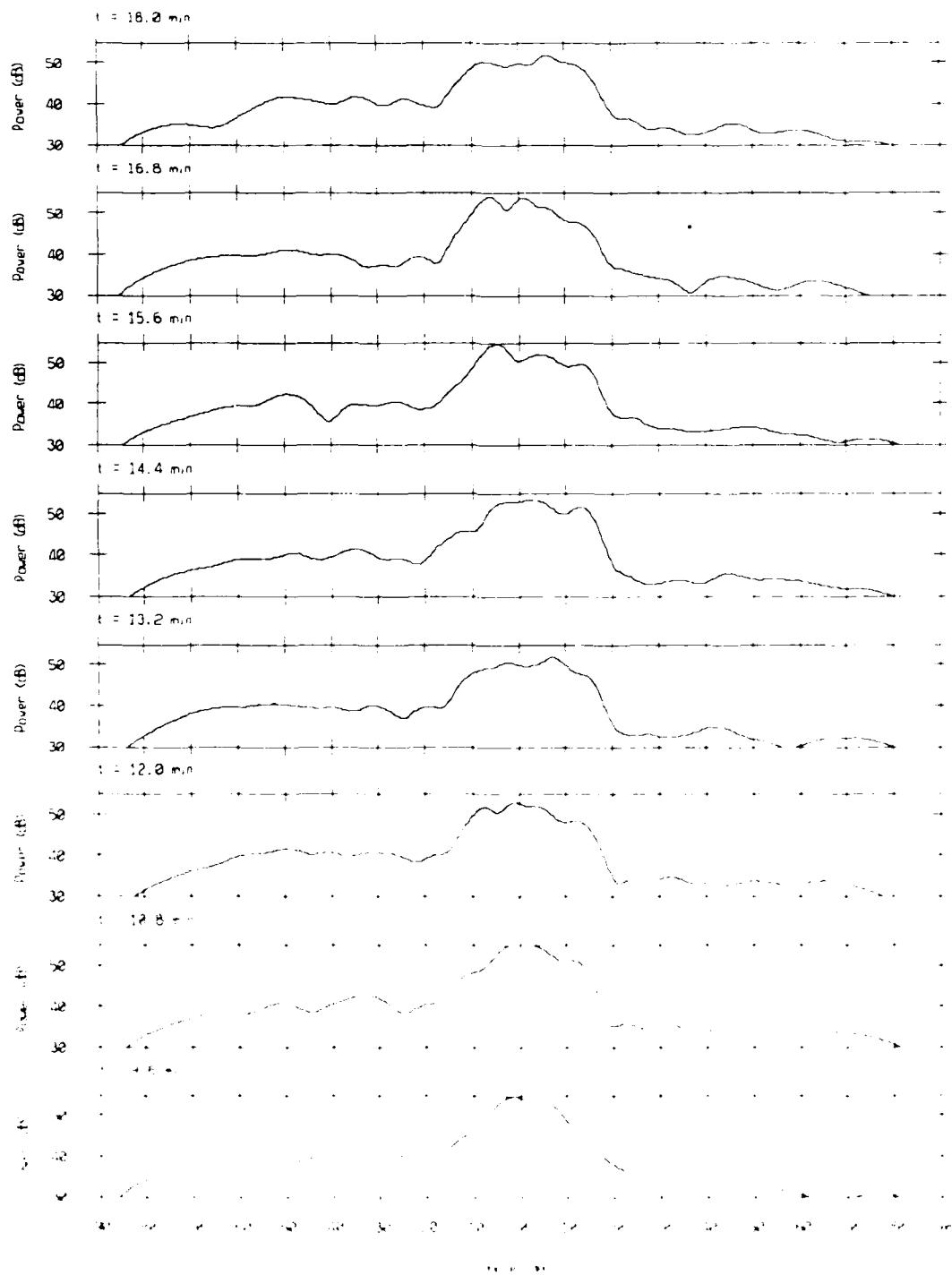
Antay Response - 85212 Bin #5922

f = 222 Hz, KB window (signs) = 1.0.



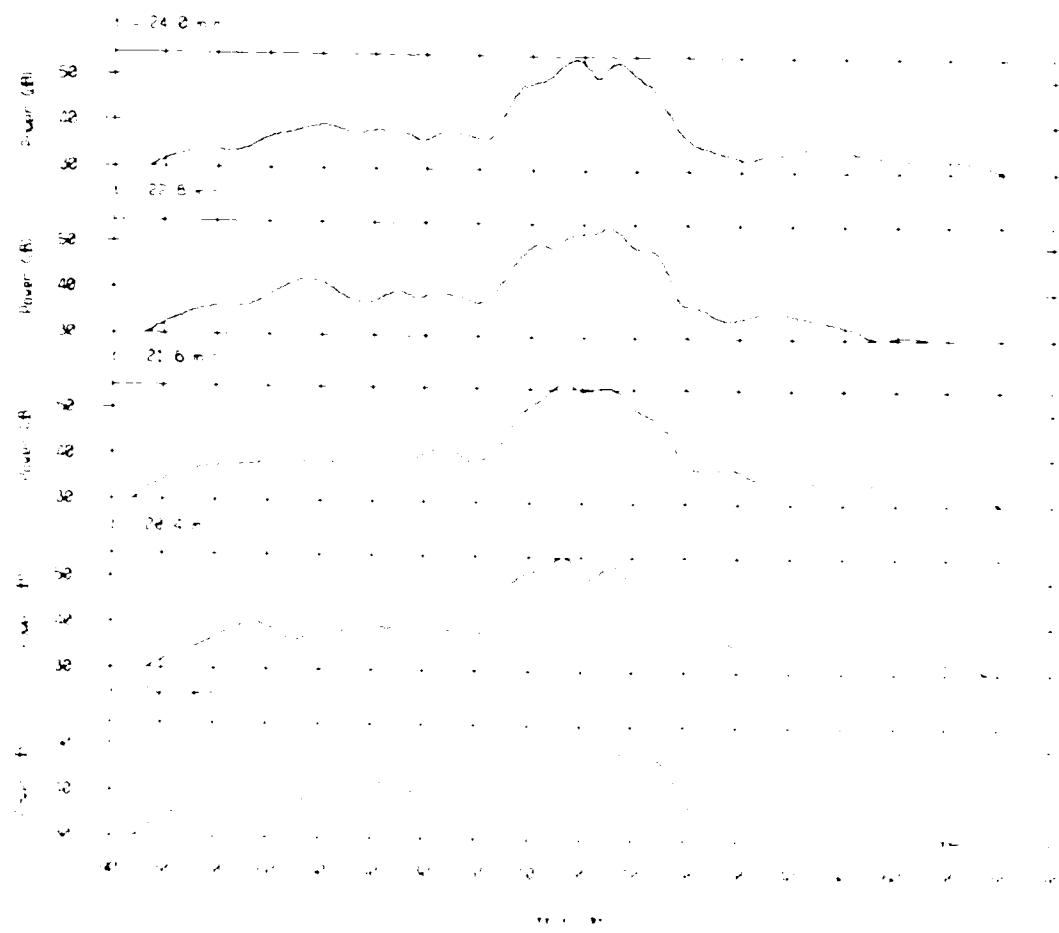
Grac₃ Response - 85010 Bin #5922

f = 200 Hz, KB window (slope = 1.5)



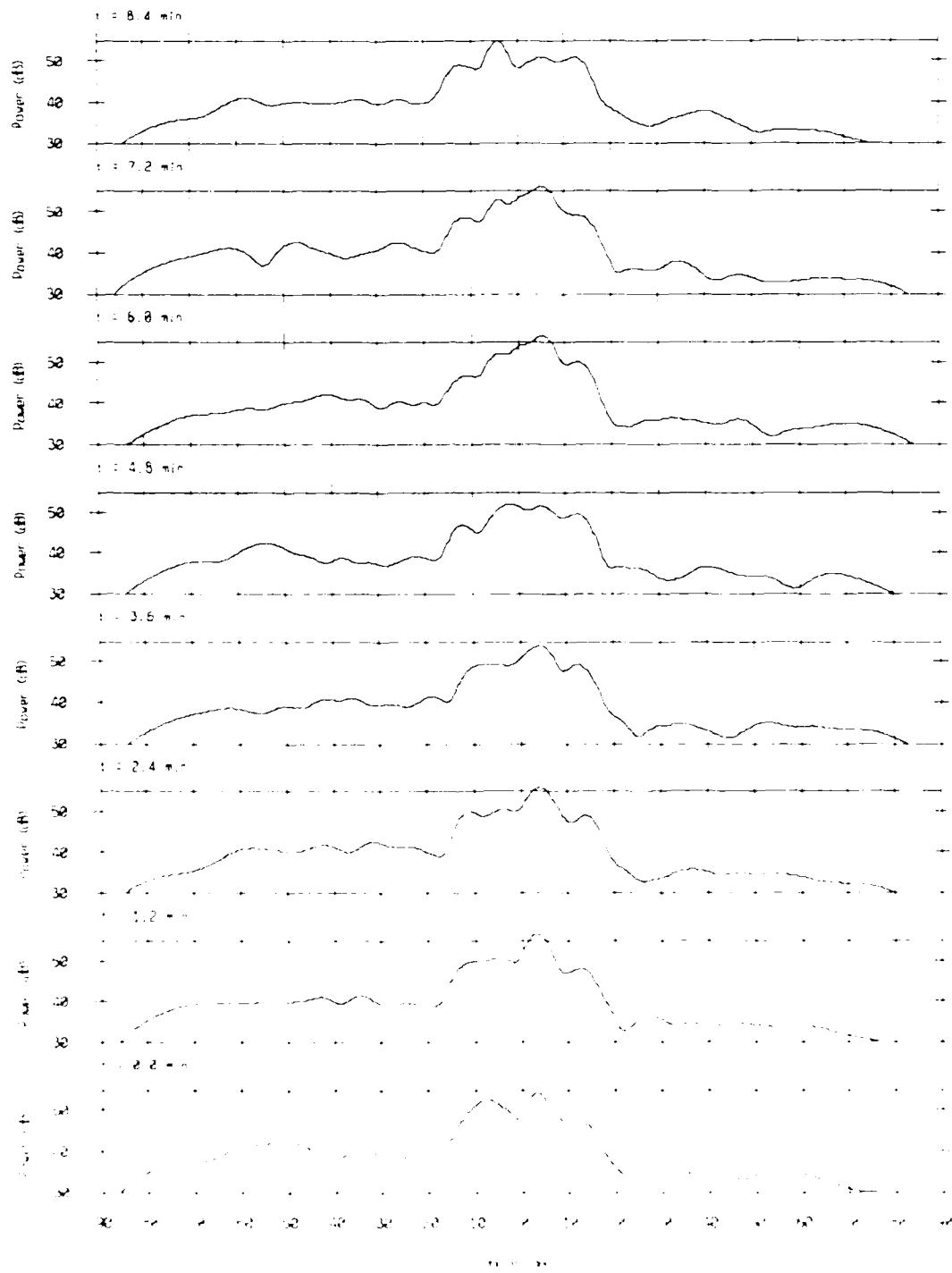
Prin. Response = 85812 Blk #5922

F = 222 Hz, Δ window slope = 1.0

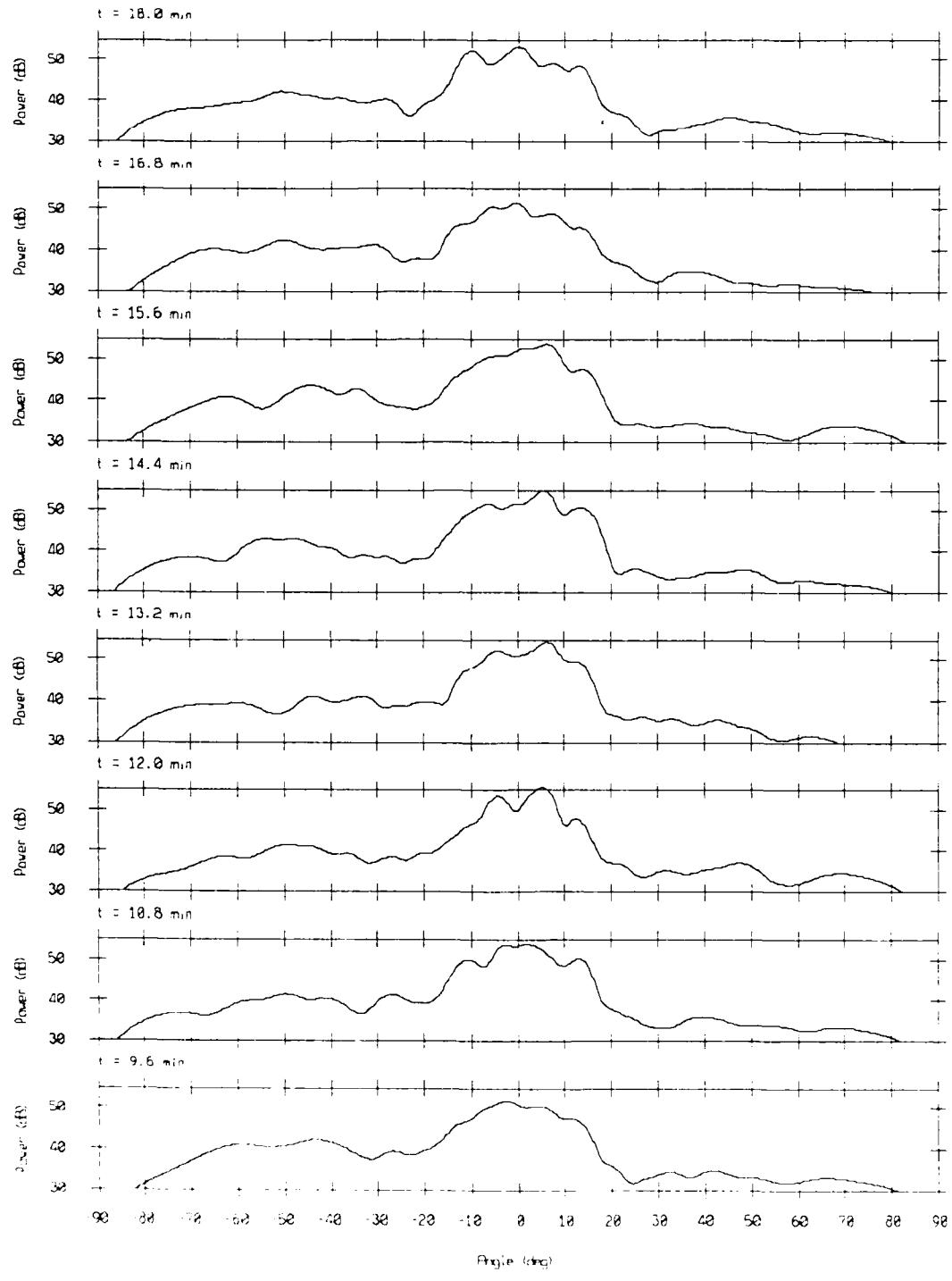


Array Response - 85212 BH #6127

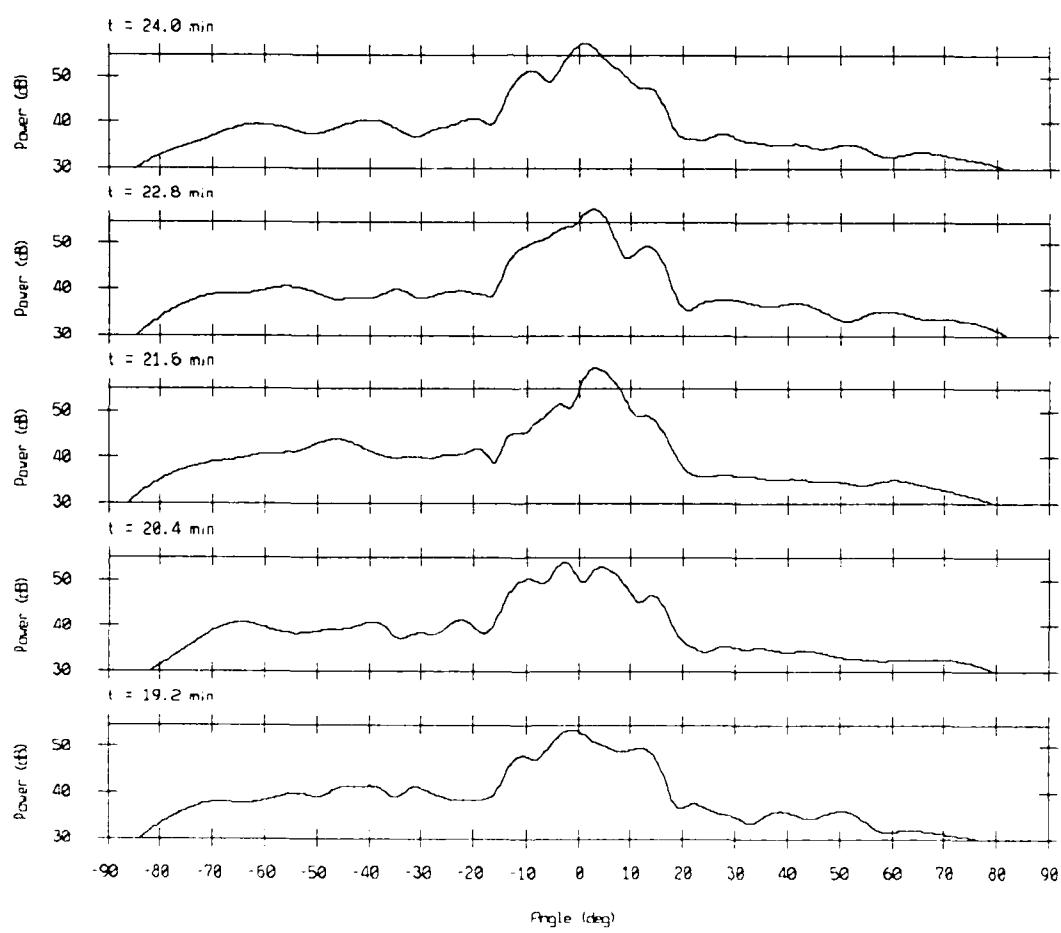
$f = 225$ Hz, KB window ($\text{cycles} = 1.5$)



Array Response - 85010 Bin #6127
 $f = 225$ Hz, KB window (α lpha = 1.5)

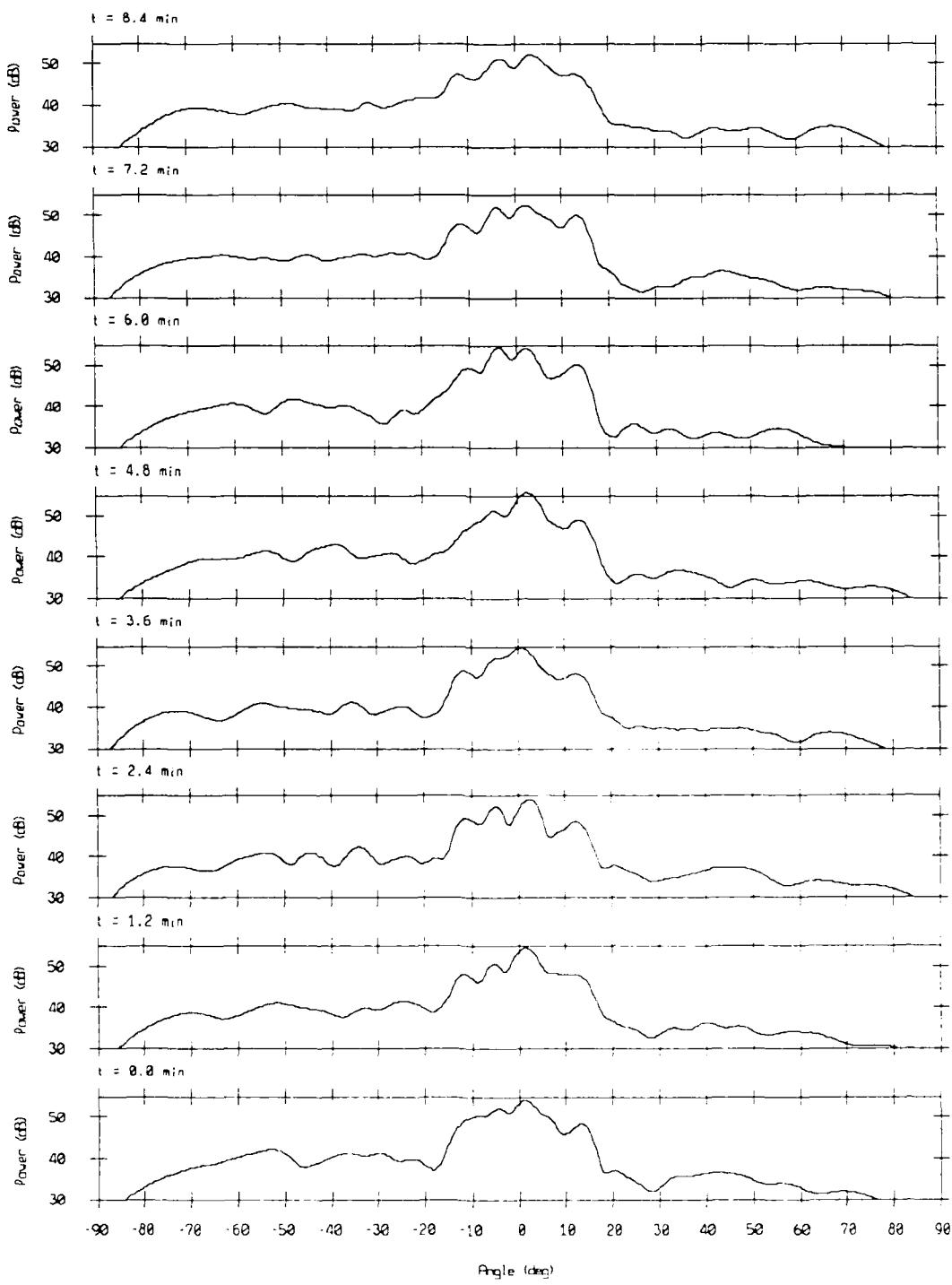


Array Response - 85010 Bin #6127
 $f = 225$ Hz, KB window ($\alpha = 1.5$)



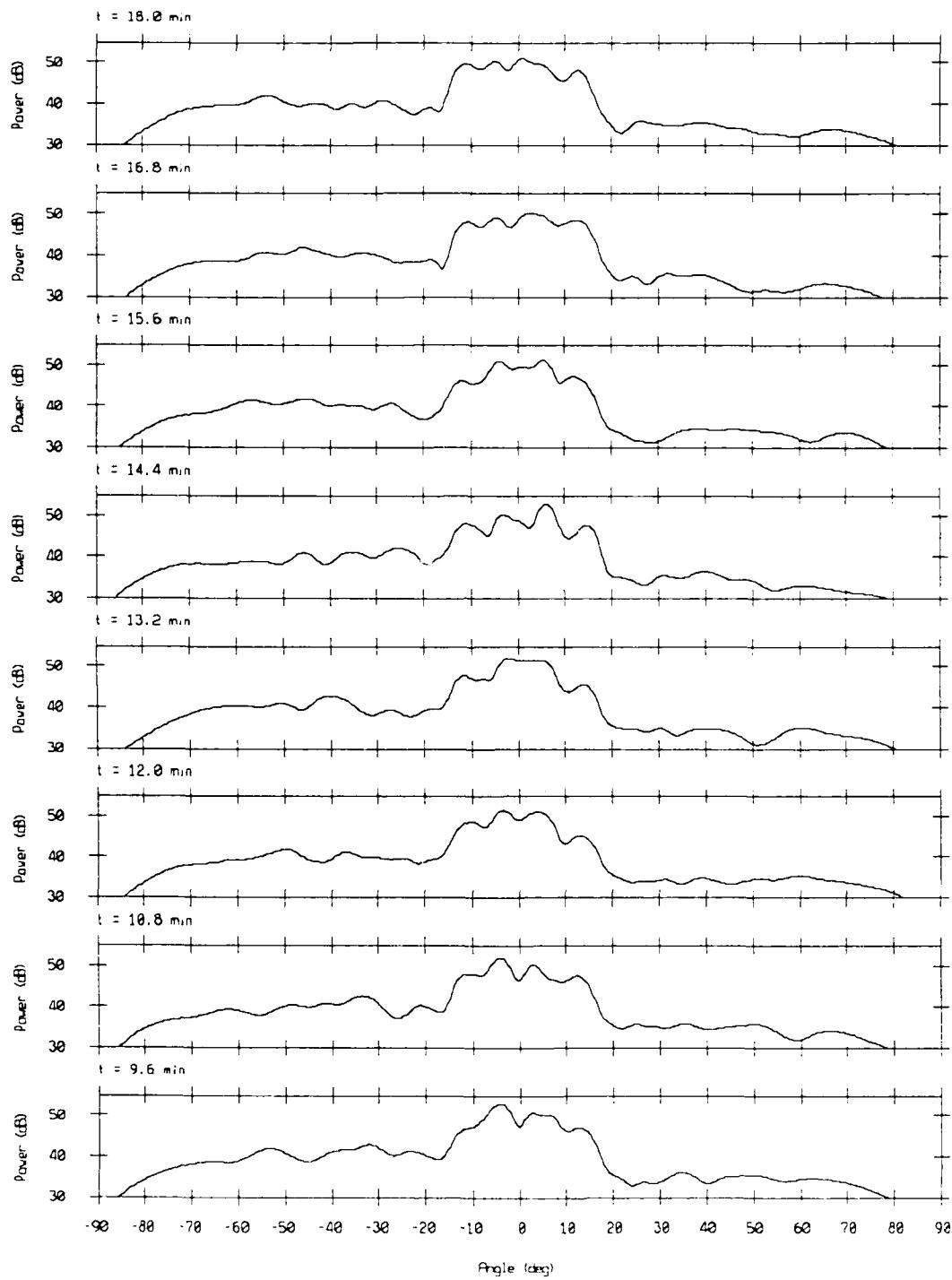
Array Response - 85010 Bin #6354

f = 250 Hz, KB window (α) = 1.5

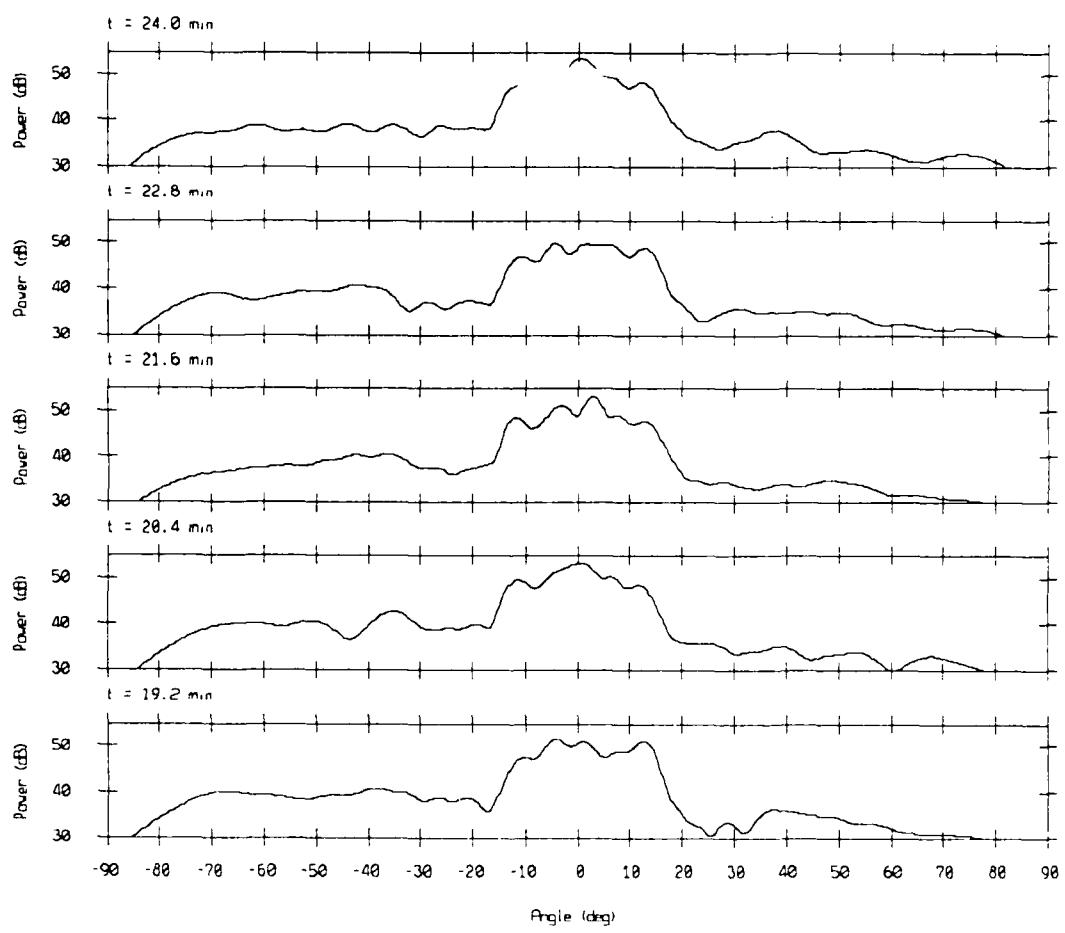


Array Response - 85010 Bin #6354

f = 250 Hz, KB window (alpha = 1.5)

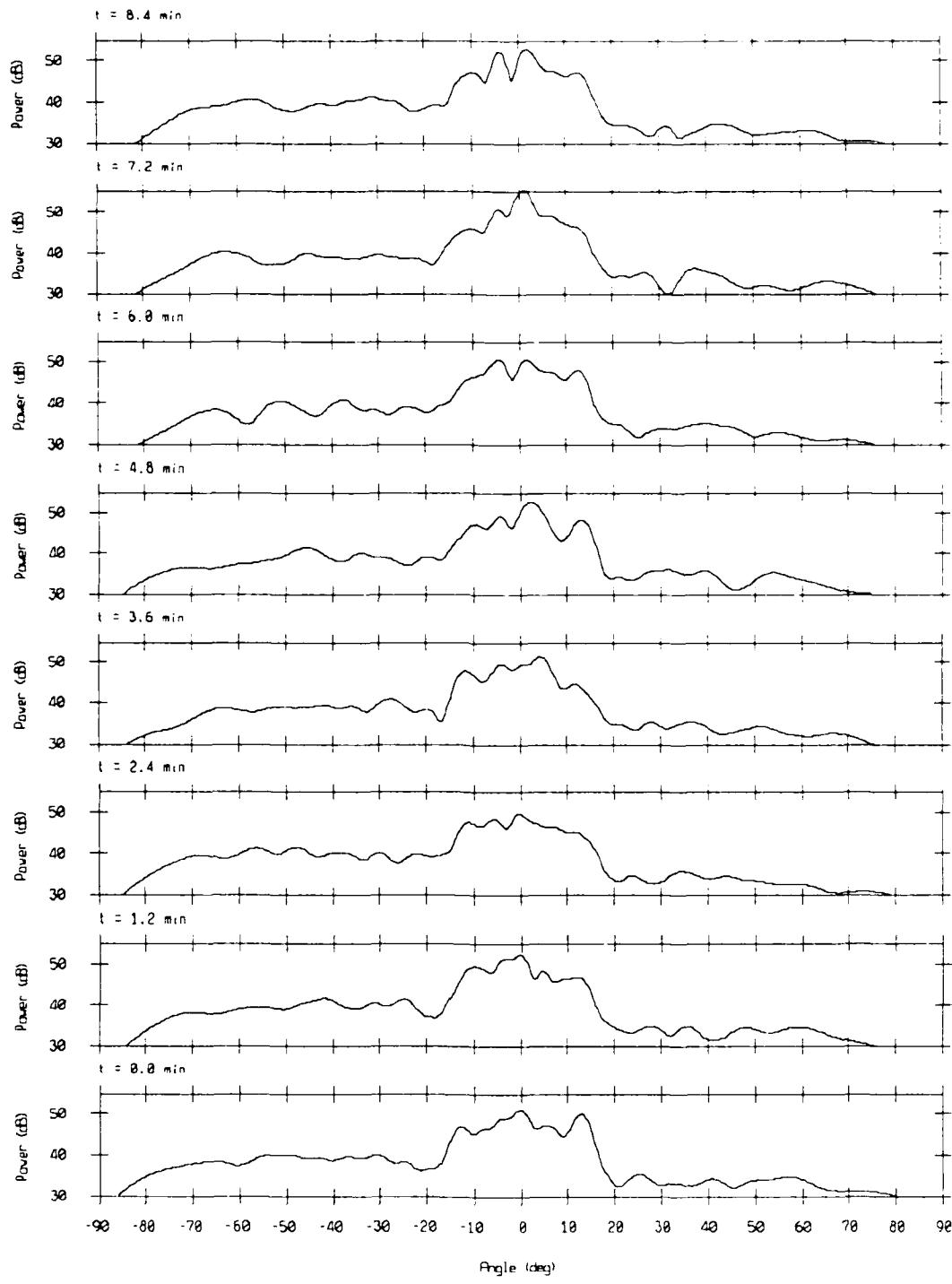


Array Response - 85010 Bin #6354
 $f = 250$ Hz, KB window ($\alpha_{pho} \approx 1.5$)



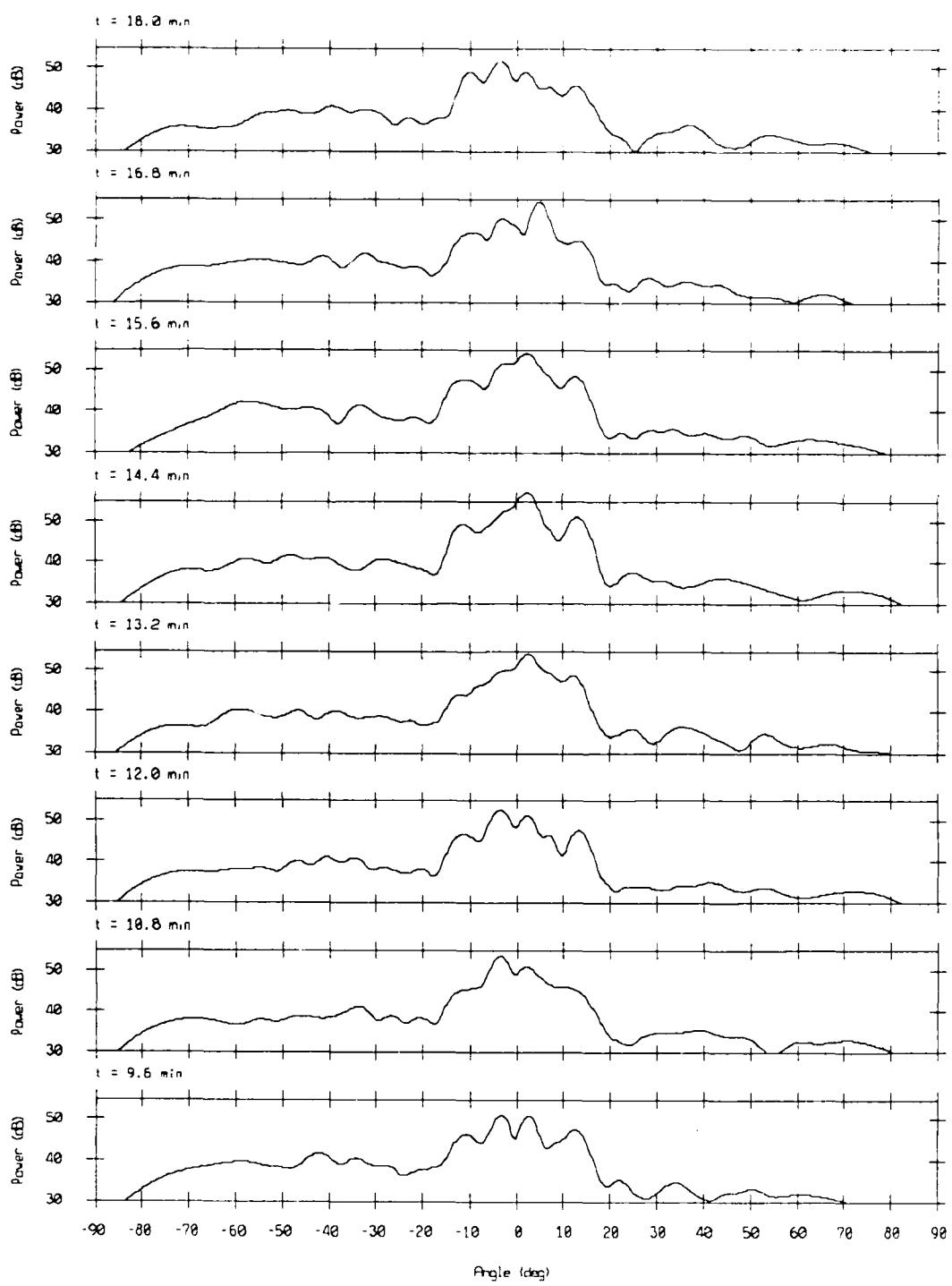
Array Response - 85010 Bin #6579

f = 275 Hz, KB window (ciprof = 1.5)



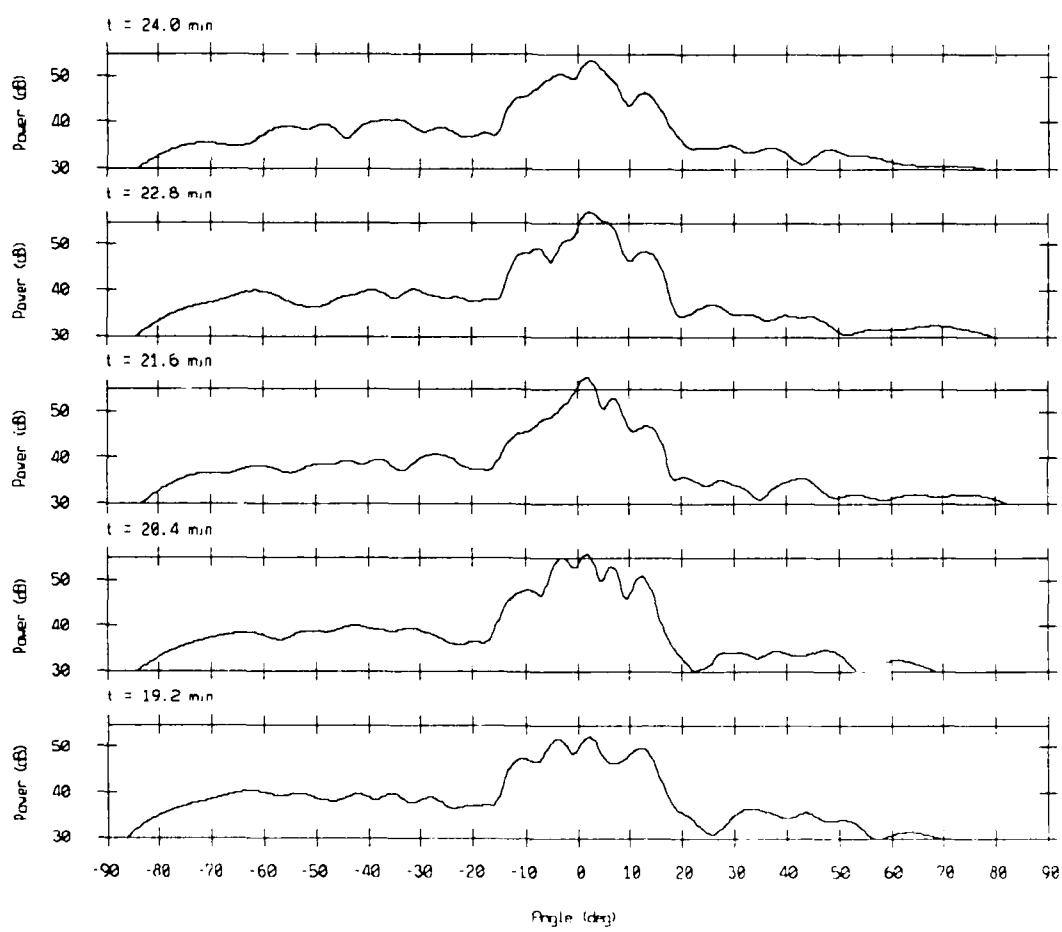
Array Response - 85010 Bin #6579

f = 275 Hz, KB window ($\alpha_{lens} = 1.5$)



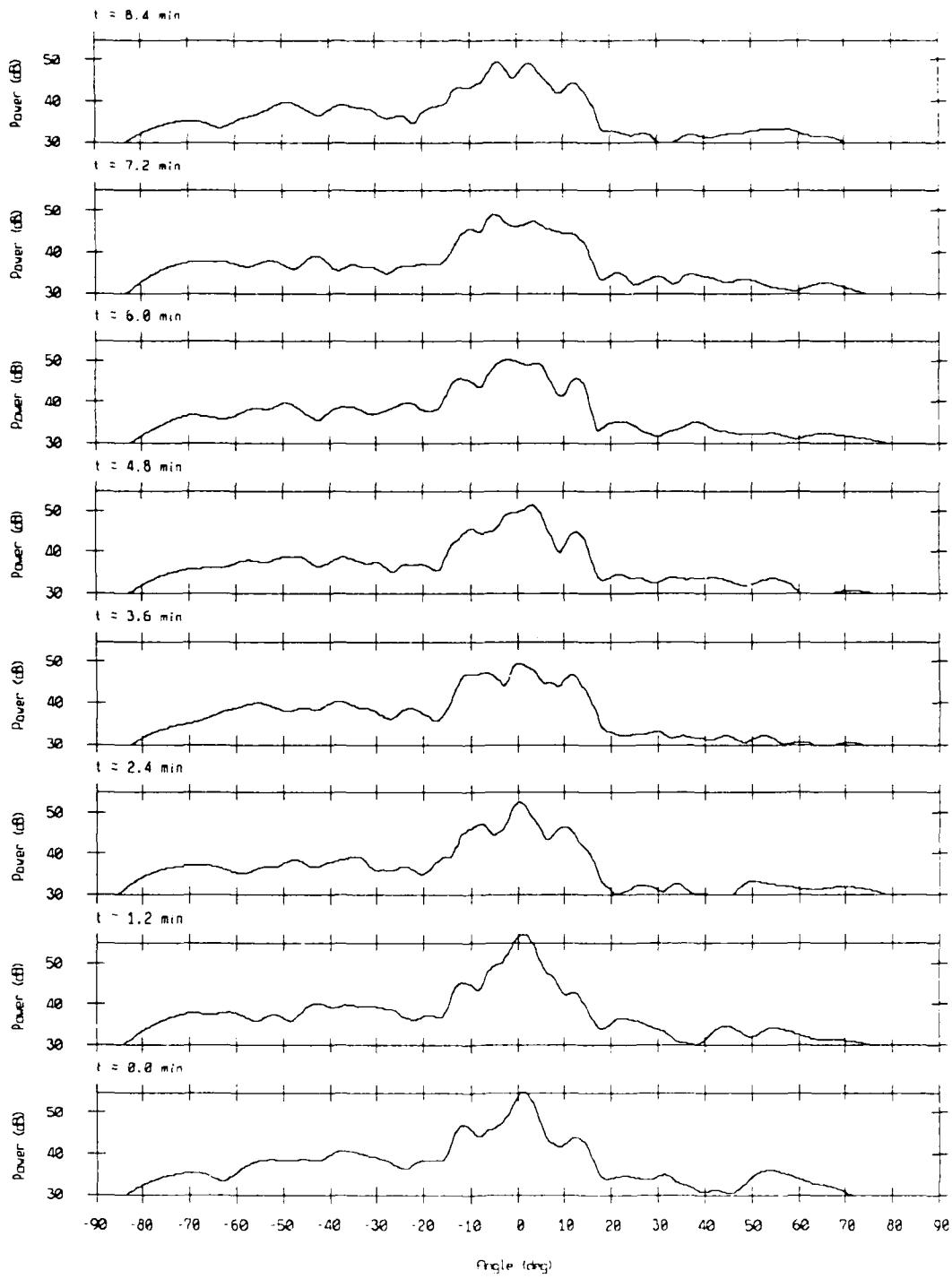
Array Response - 85010 Bin #6579

f = 275 Hz, KB window (alpha = 1.5)

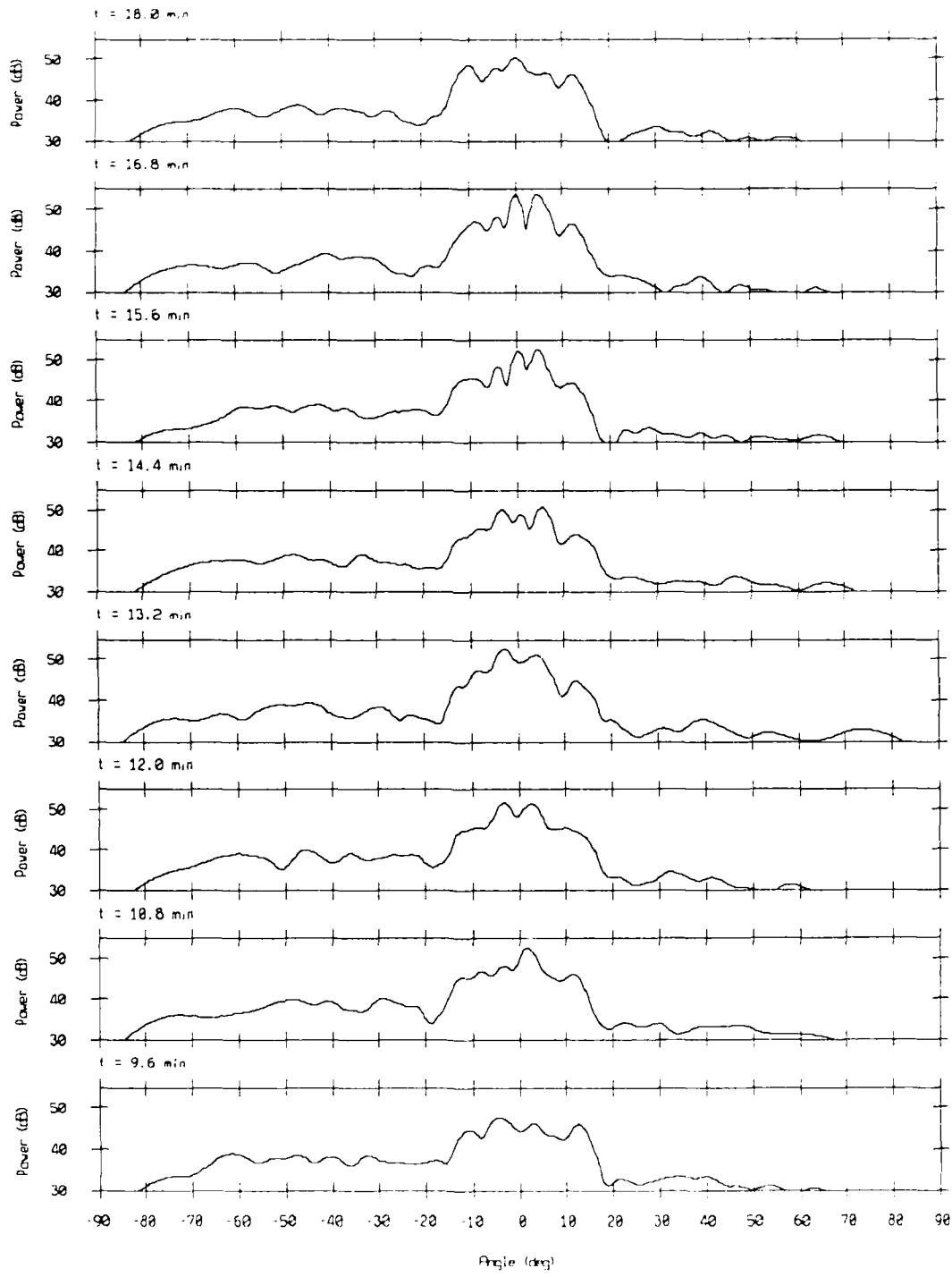


Array Response - 85010 Bin #6804

f = 300 Hz, KB window ($\alpha_{phc} = 1.5$)

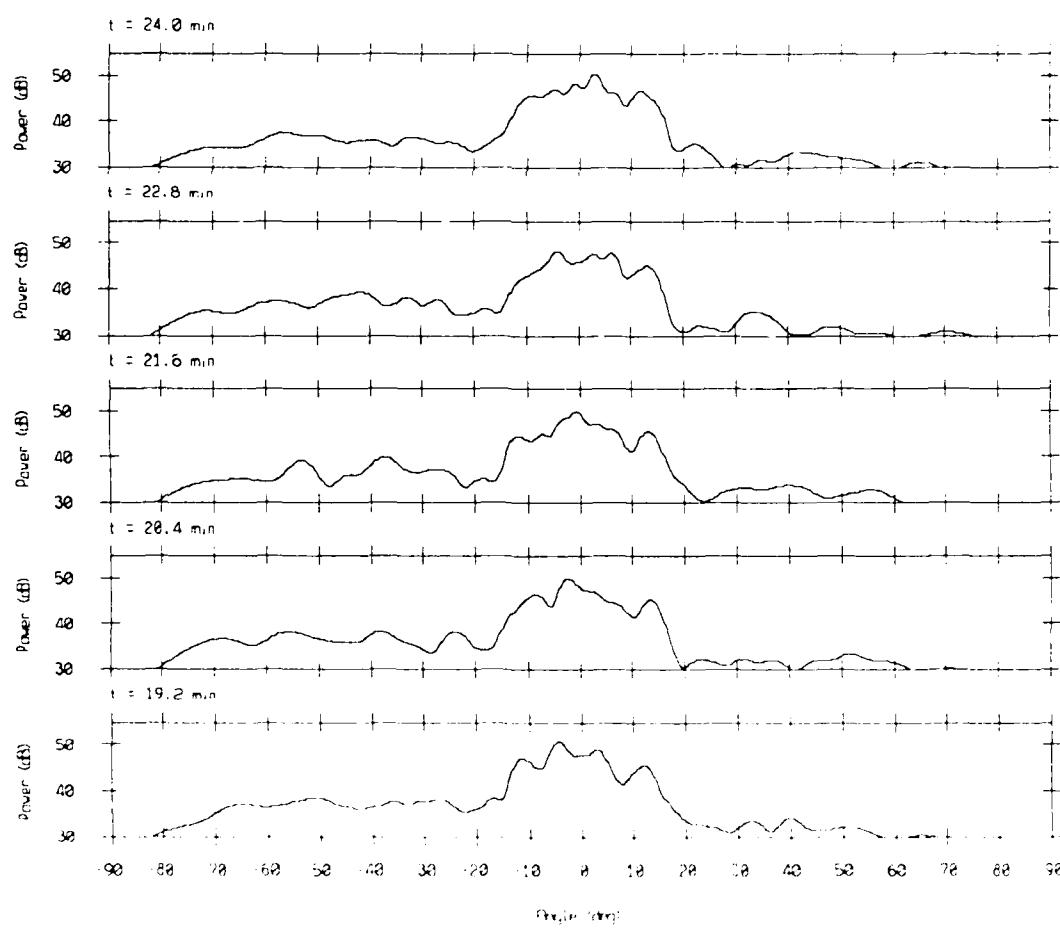


Polar Response - 85210 3:0 #6824
 $f = 302$ Hz, K3 window (s) pre = 1.5



Array Response = 88212.BIN #0824

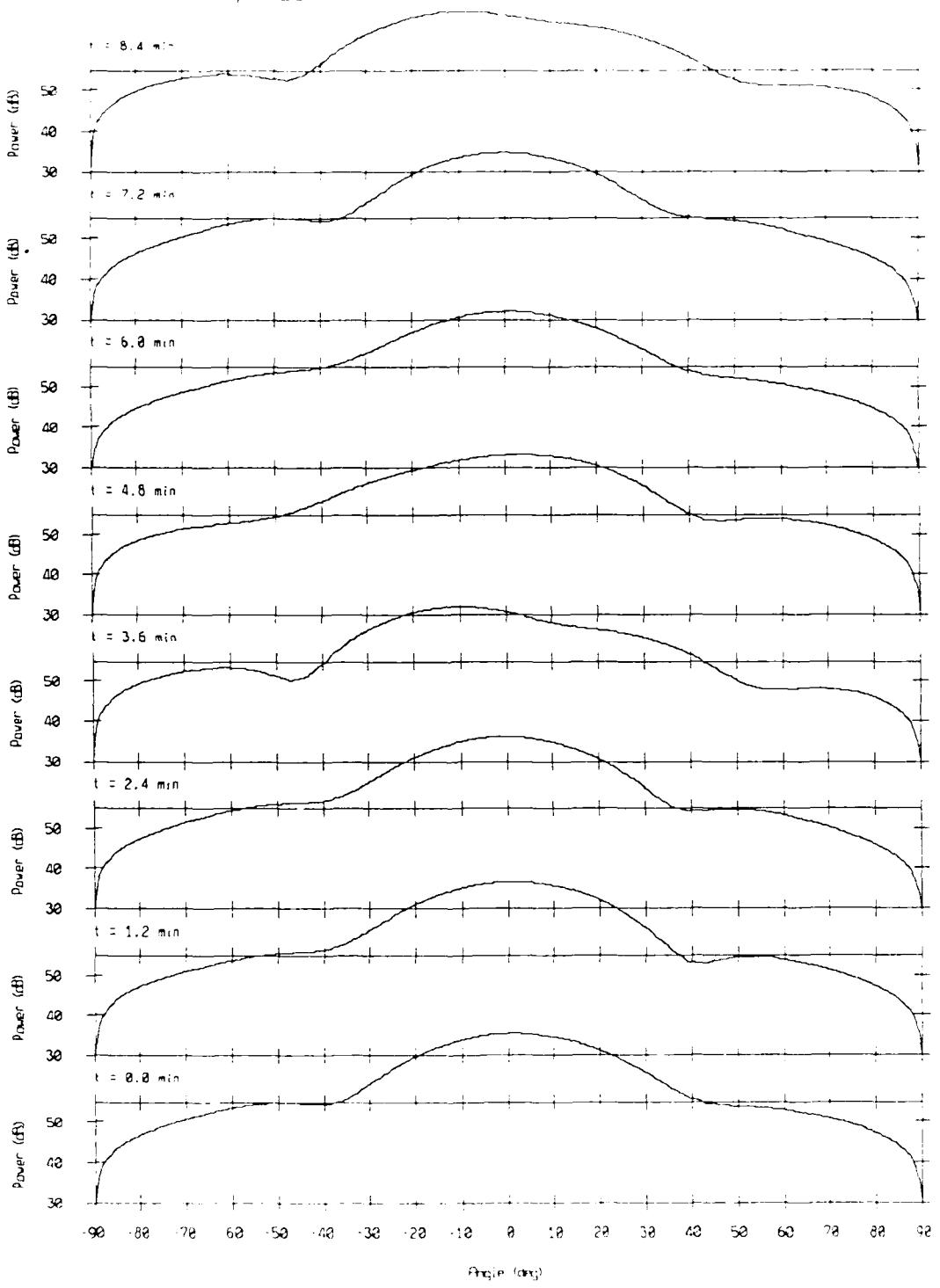
f = 322 Hz, KB window (frames = 1.5)



VII. Array Response: Panels, Rect Window.

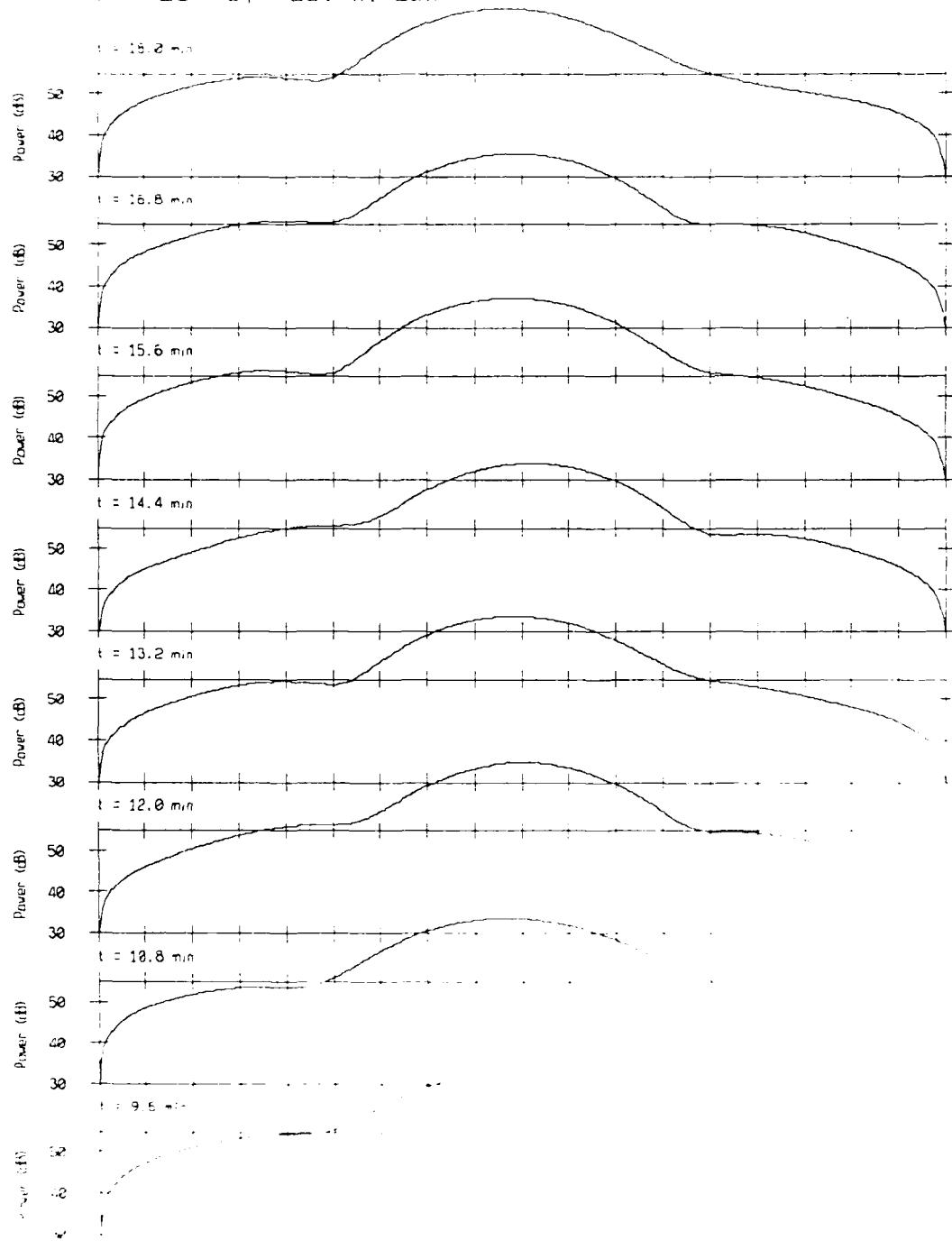
Binary Resources 85812 312 -4393

$f = 25 \text{ Hz}$, rect window

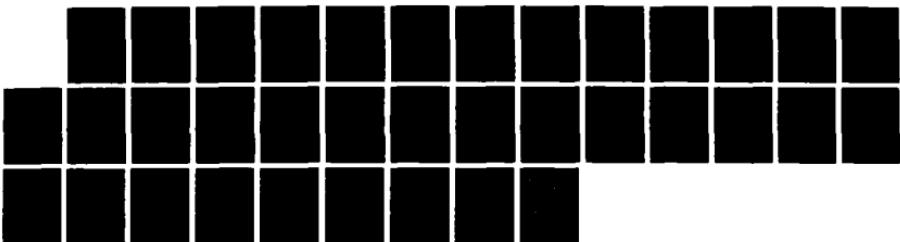


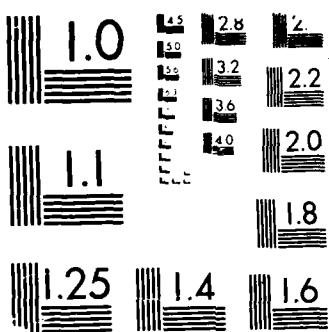
Grain Response - 85010 Bin #4323

f = 25 Hz, rect window



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A FUNCTION OF LOM. (U) SCRIPPS INSTITUTION OF
OCEANOGRAPHY LA JOLLA CA MARINE PHYSIC.
UNCLASSIFIED W S HODGKISS ET AL. JAN 88 MPL-TM-387-B F/G 20/1 NL



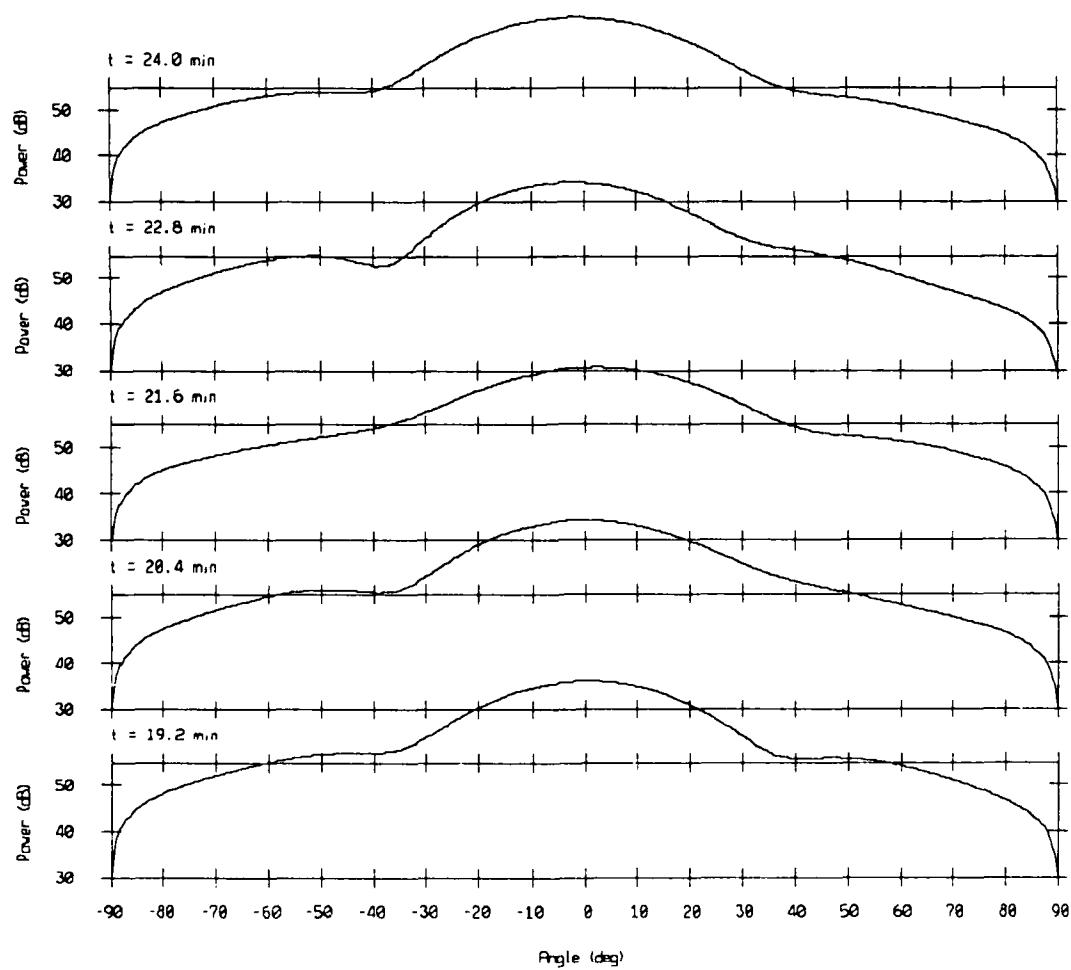


MICROCOPY RESOLUTION TEST CHART

IRCM STANDARDS 96-2

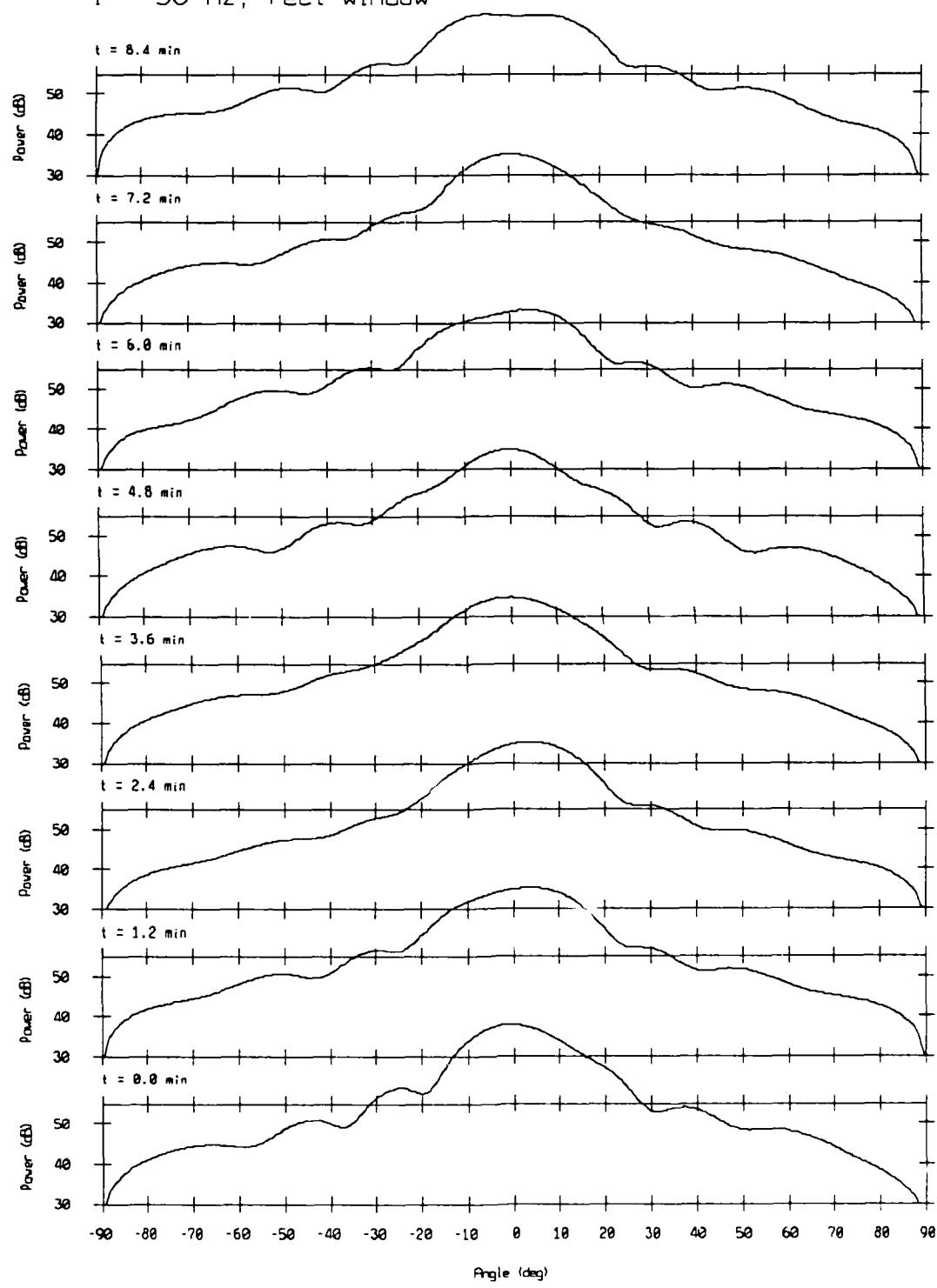
Array Response - 85010 Bin #4323

f = 25 Hz, rect window



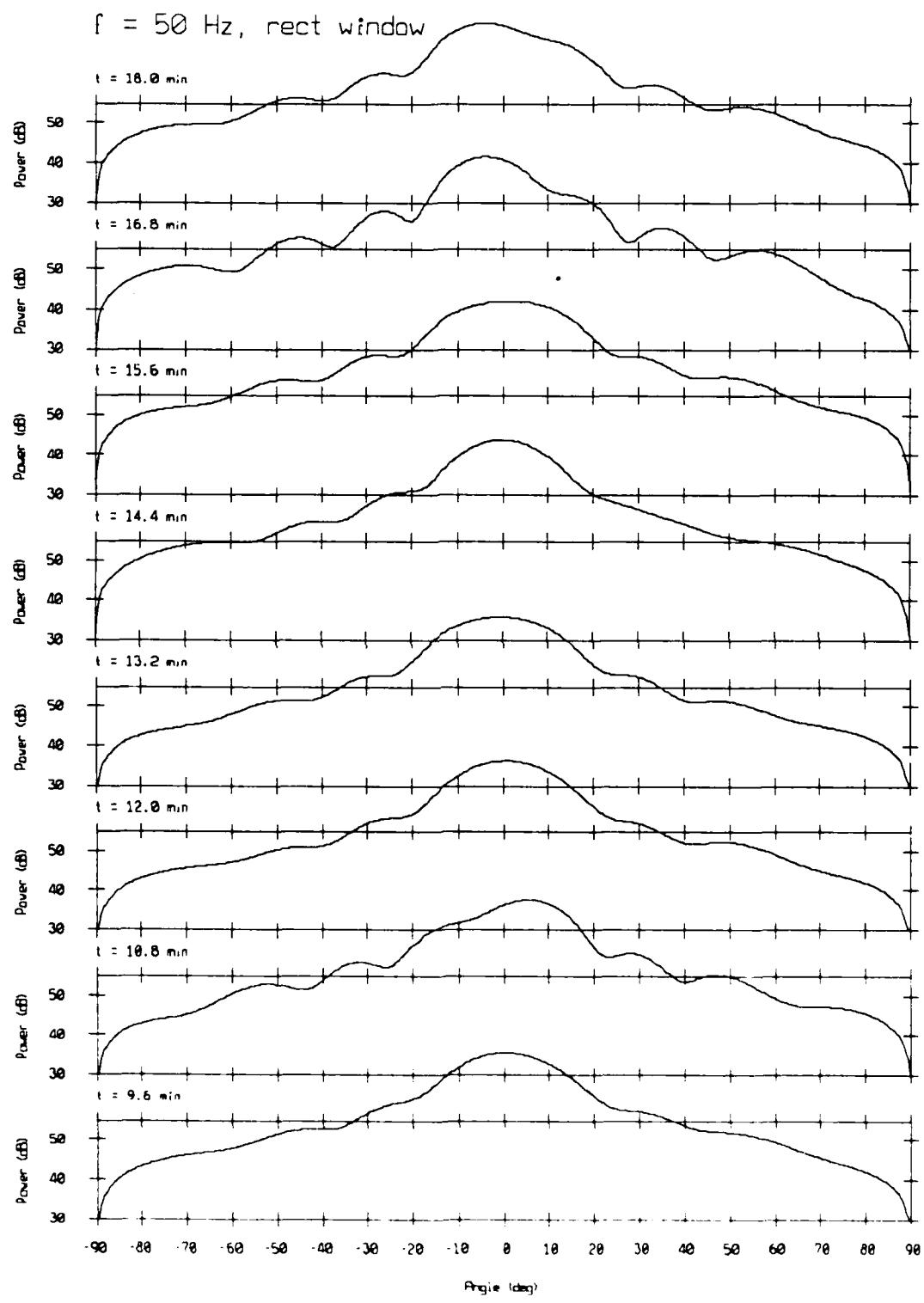
Array Response - 85010 Bin #4548

f = 50 Hz, rect window



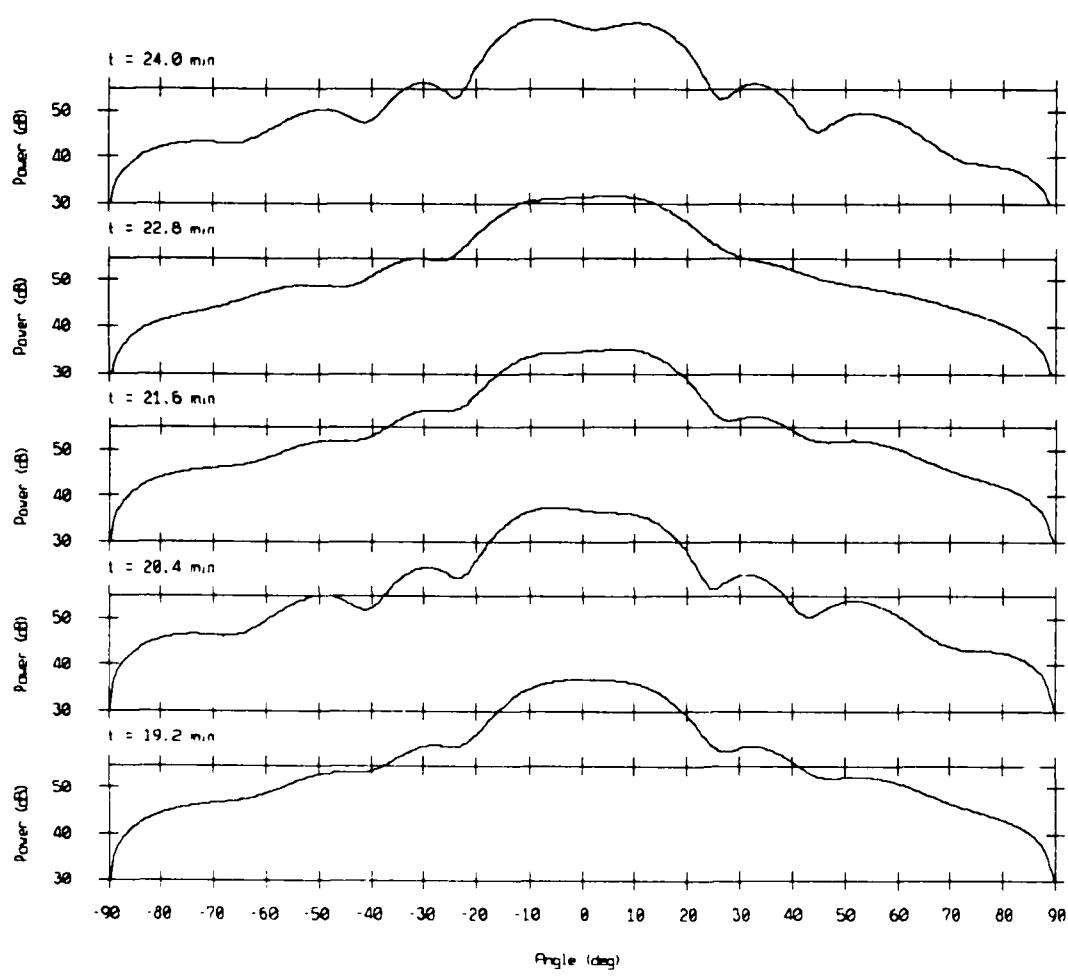
Array Response - 85010 Bin #4548

f = 50 Hz, rect window



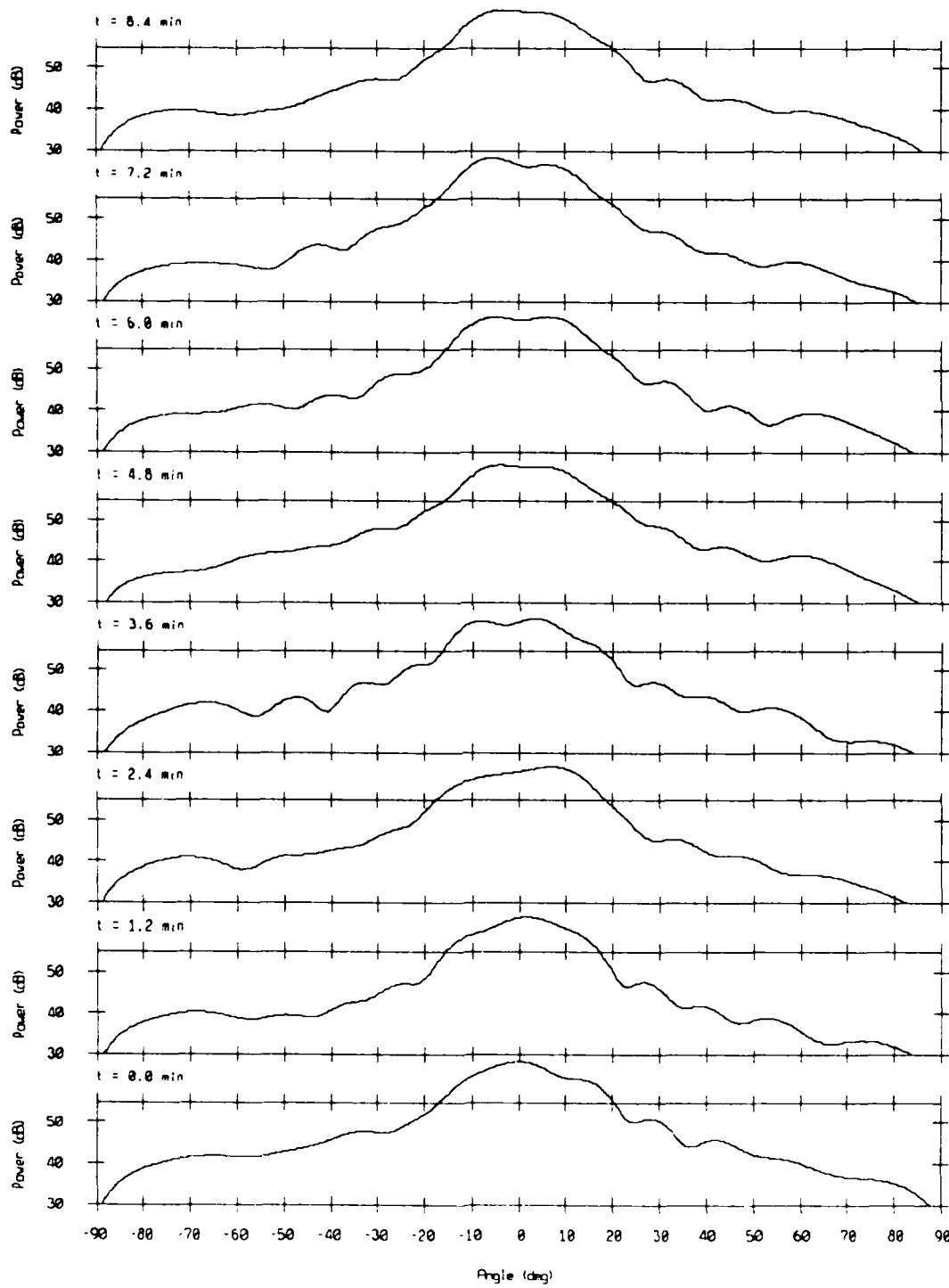
Array Response - 85010 Bin #4548

f = 50 Hz, rect window



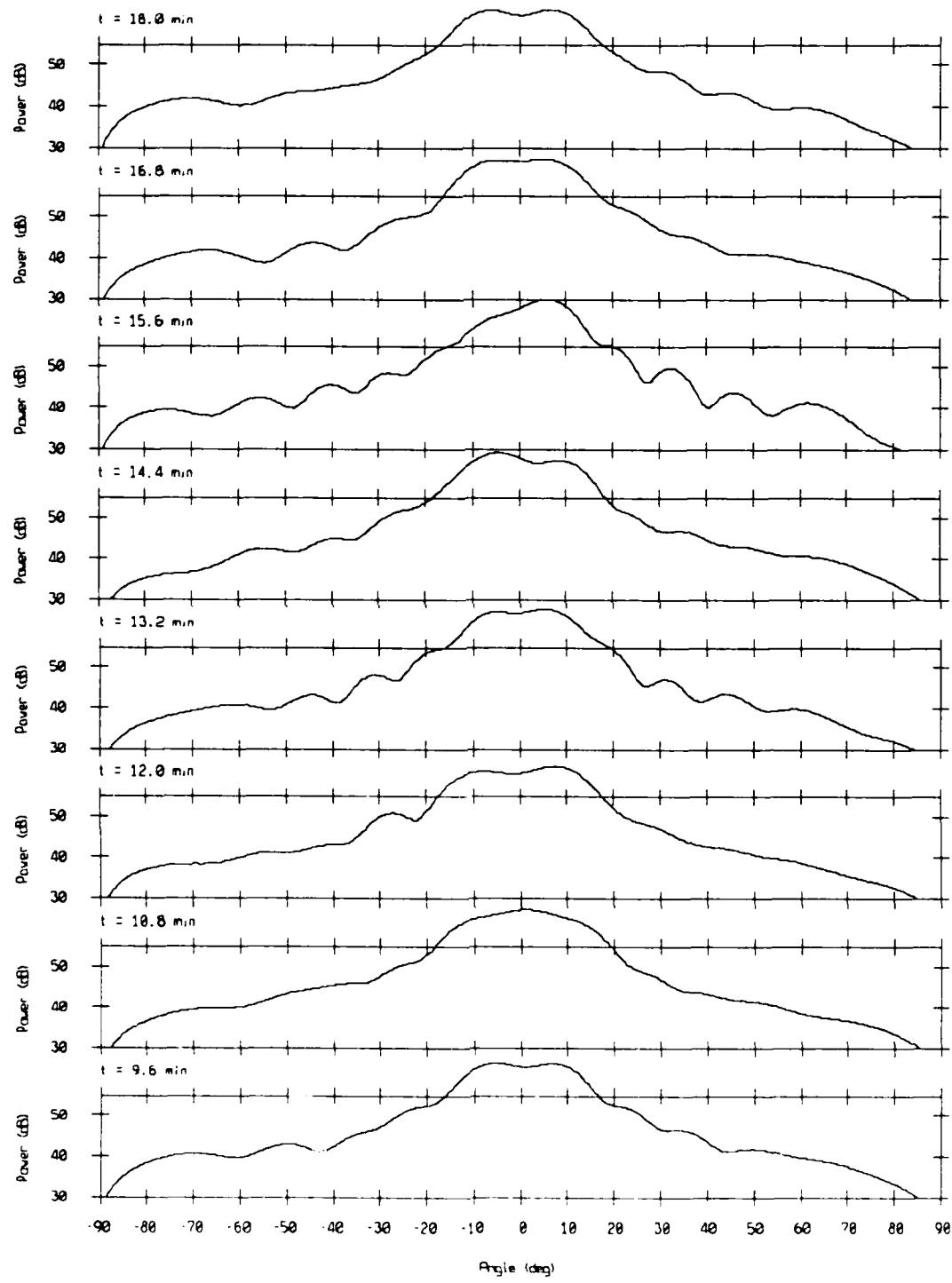
Array Response - 85010 Bin #4774

f = 75 Hz, rect window



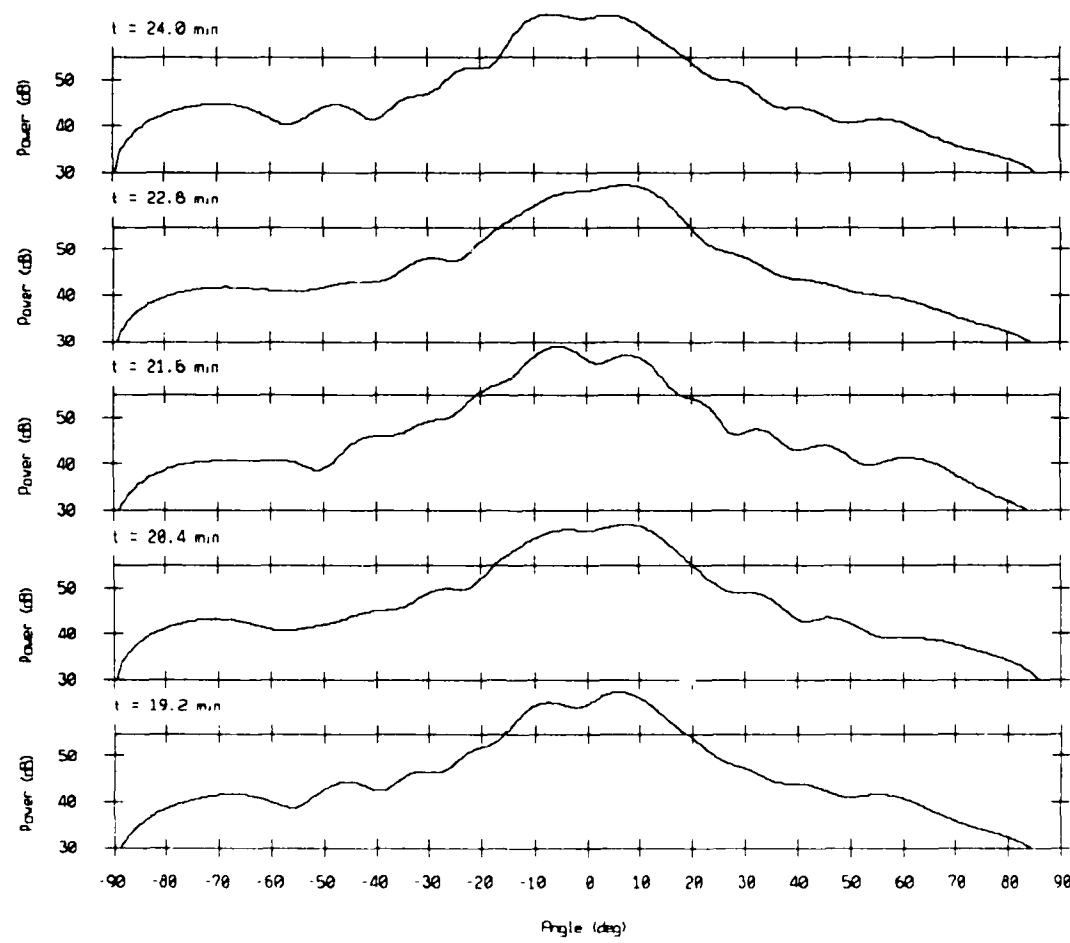
Array Response - 85010 Bin #4774

f = 75 Hz, rect window



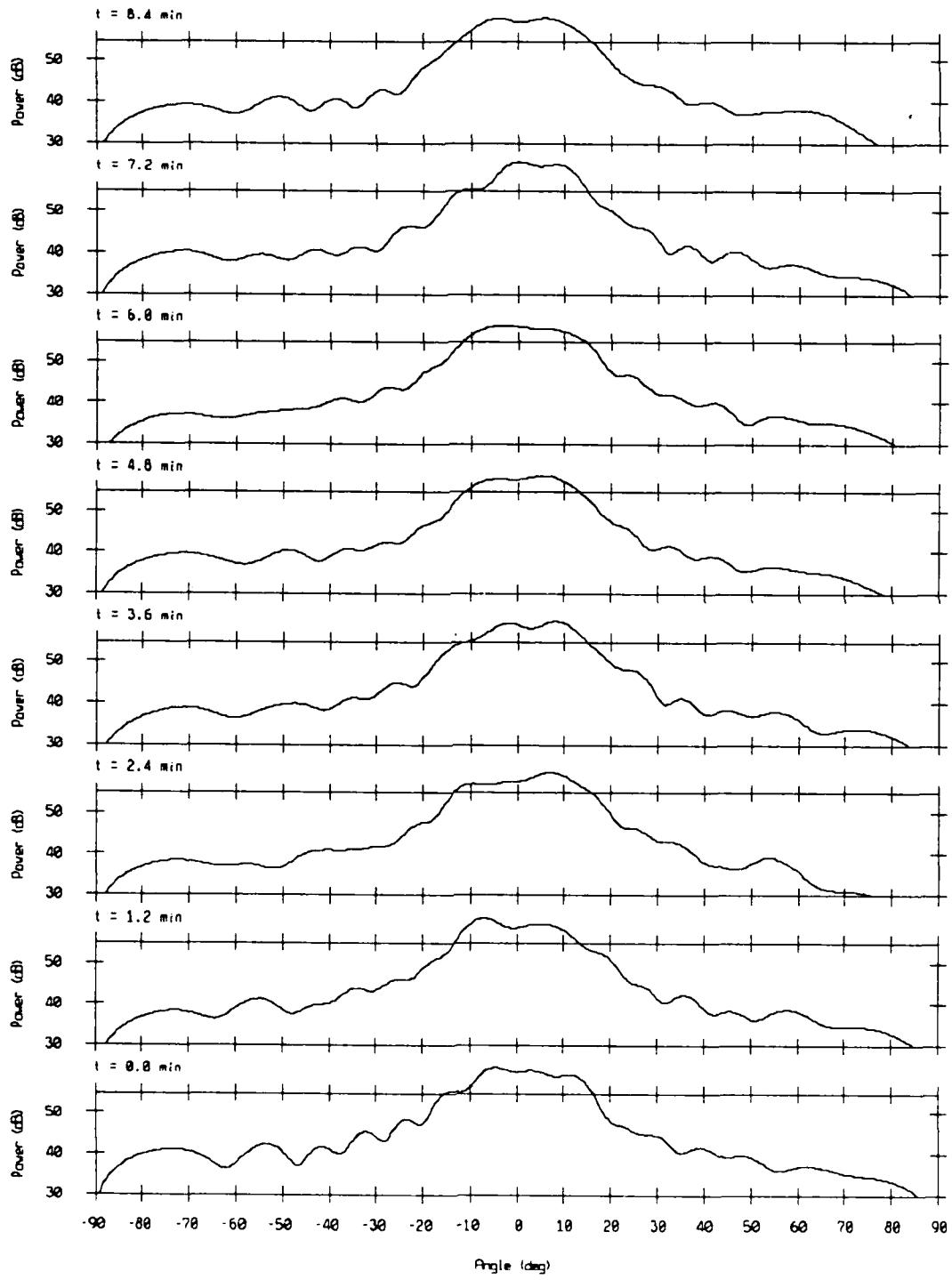
Array Response - 85010 Bin #4774

f = 75 Hz, rect window



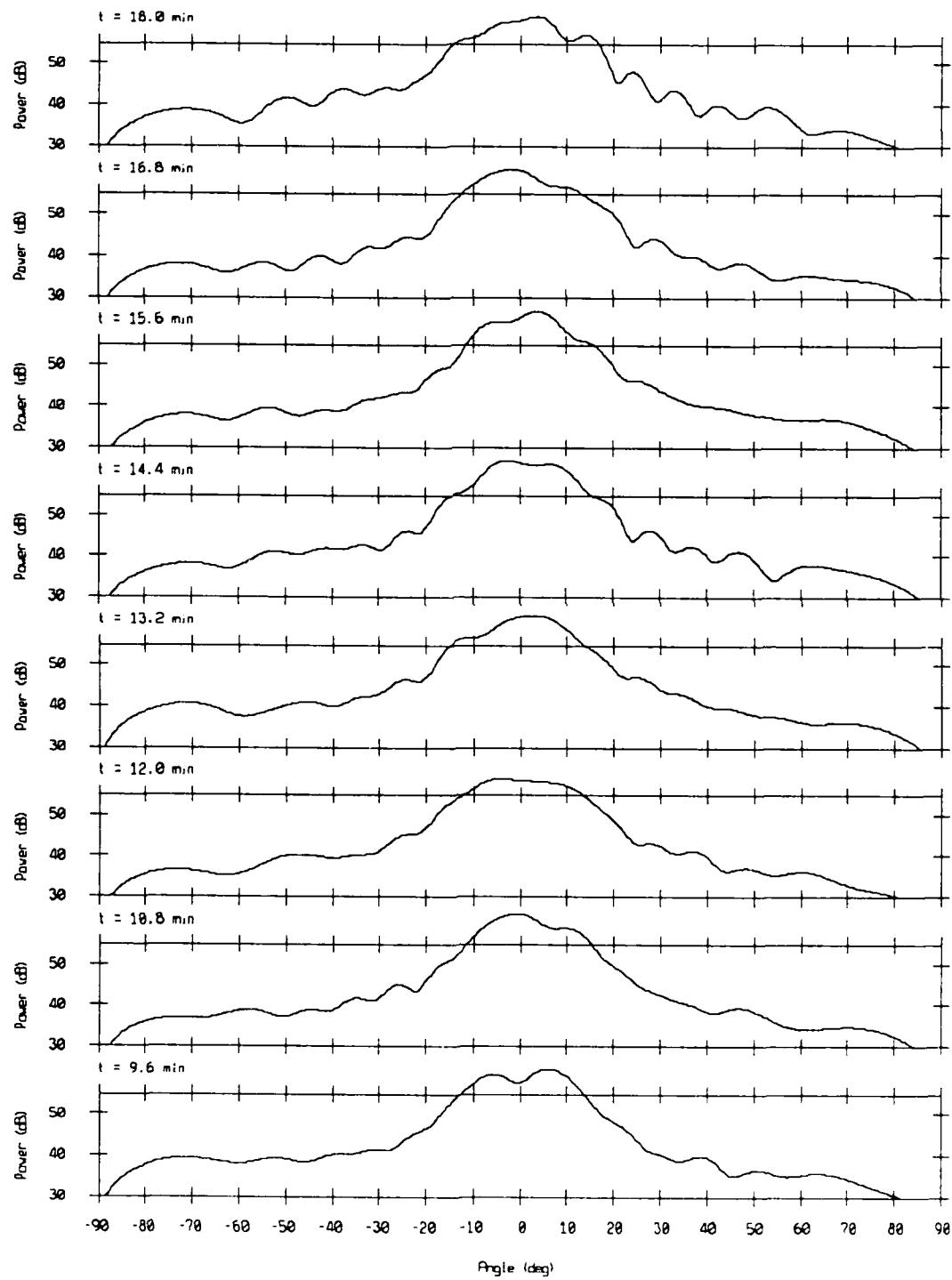
Array Response - 85010 Bin #4999

f = 100 Hz, rect window



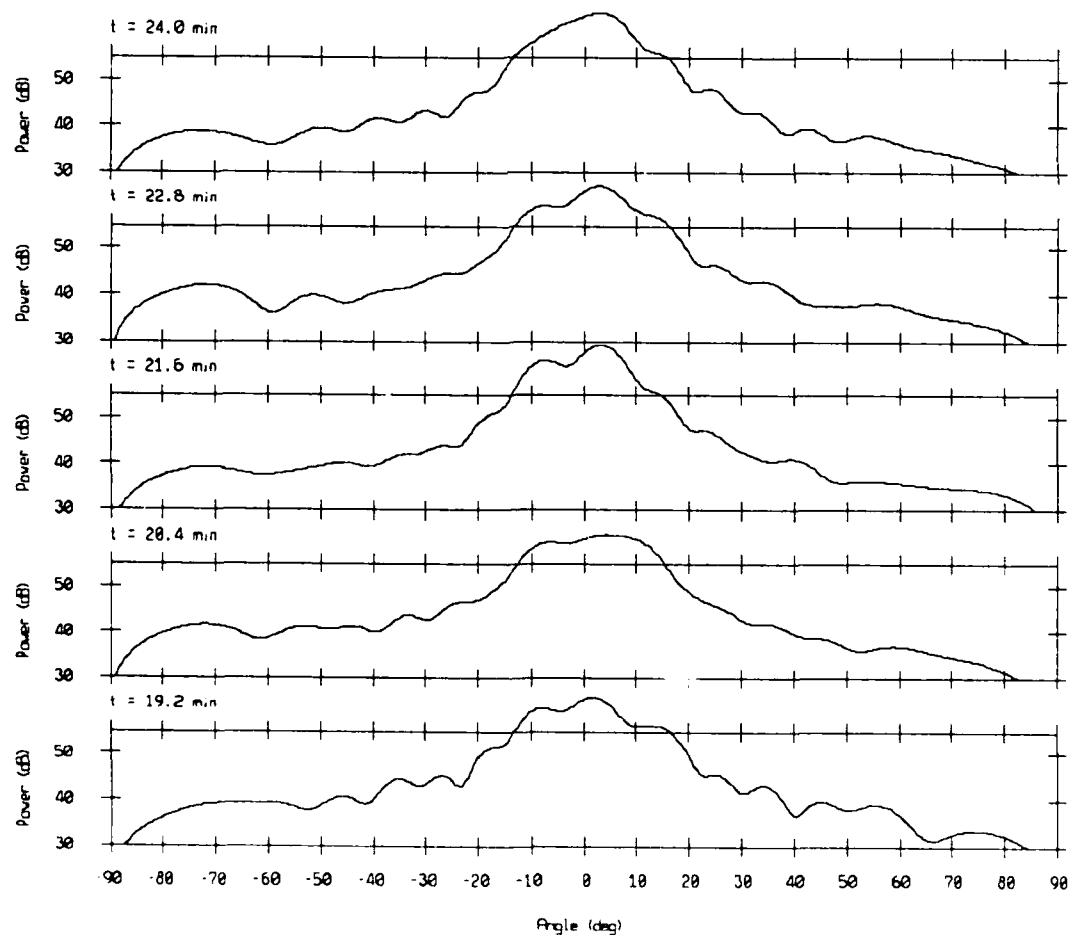
Array Response - 85010 Bin #4999

f = 100 Hz, rect window



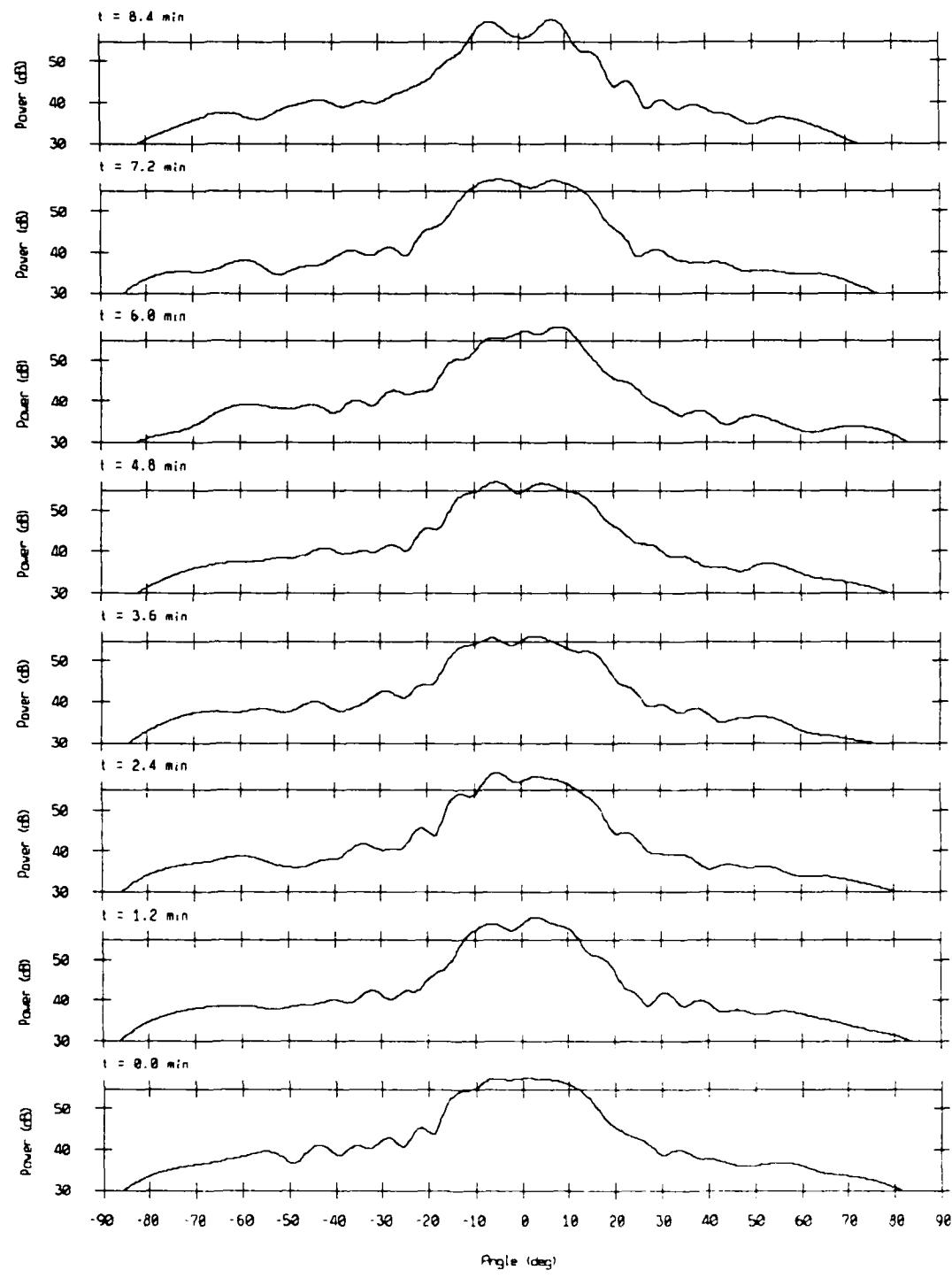
Array Response - 85010 Bin #4999

f = 100 Hz, rect window



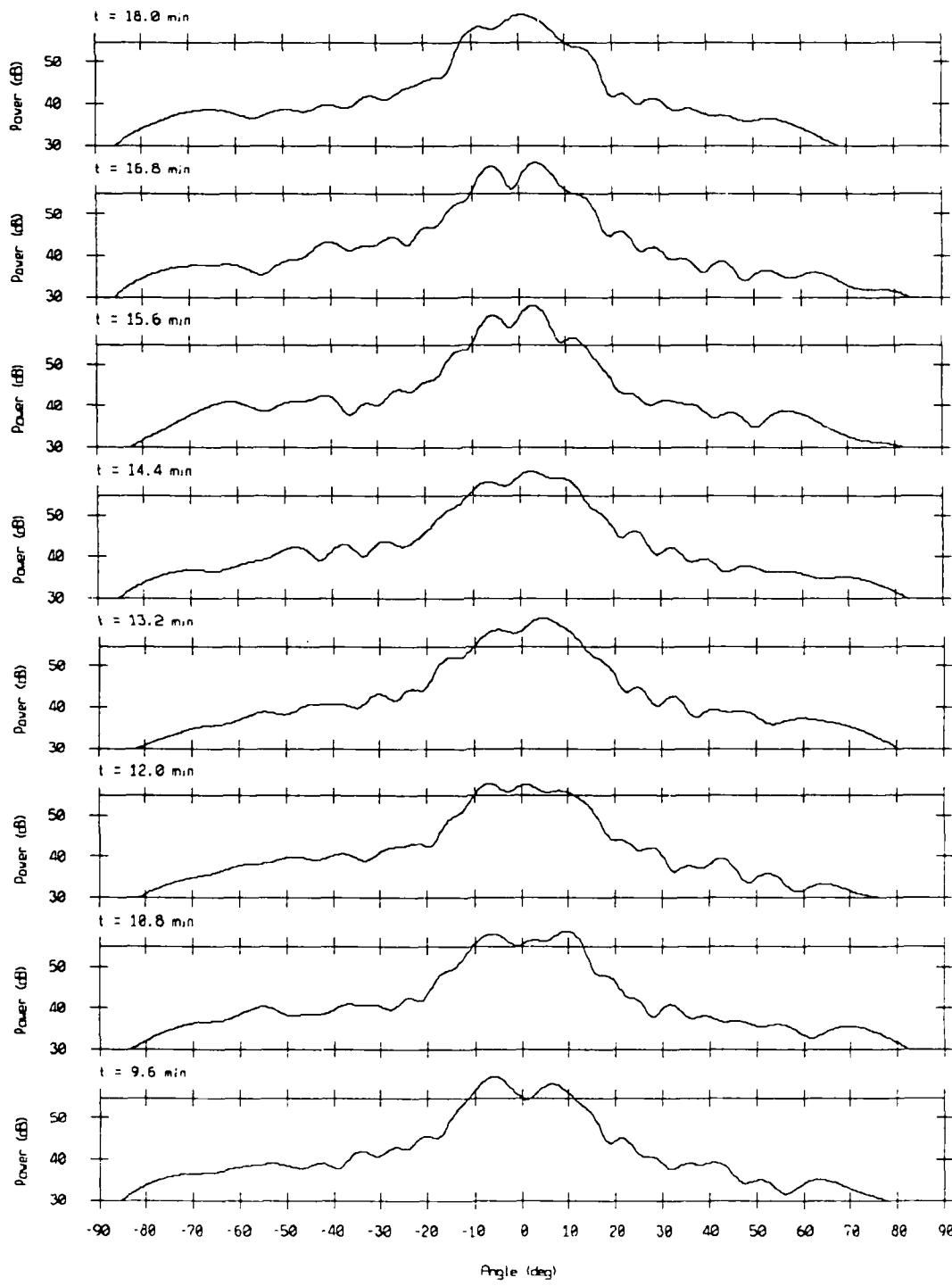
Array Response - 85010 Bin #5225

f = 125 Hz, rect window

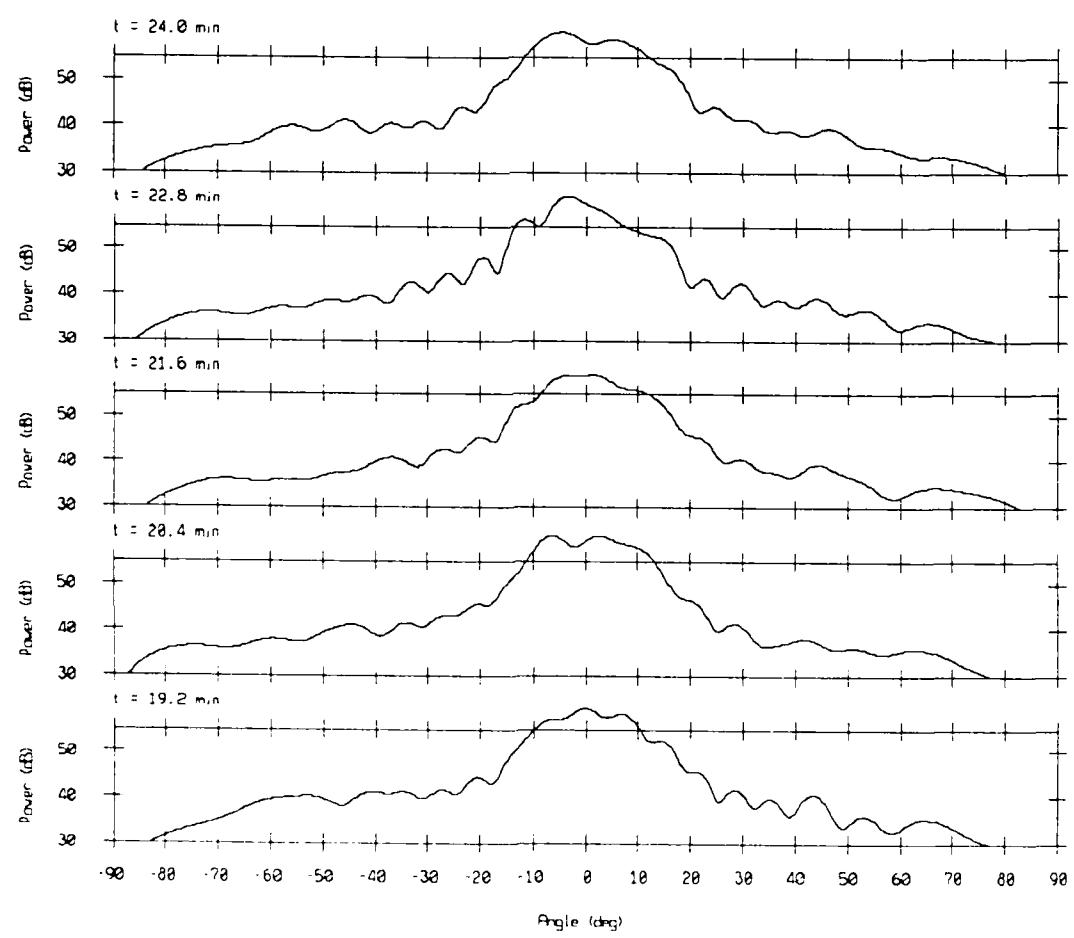


Array Response - 85010 Bin #5225

f = 125 Hz, rect window

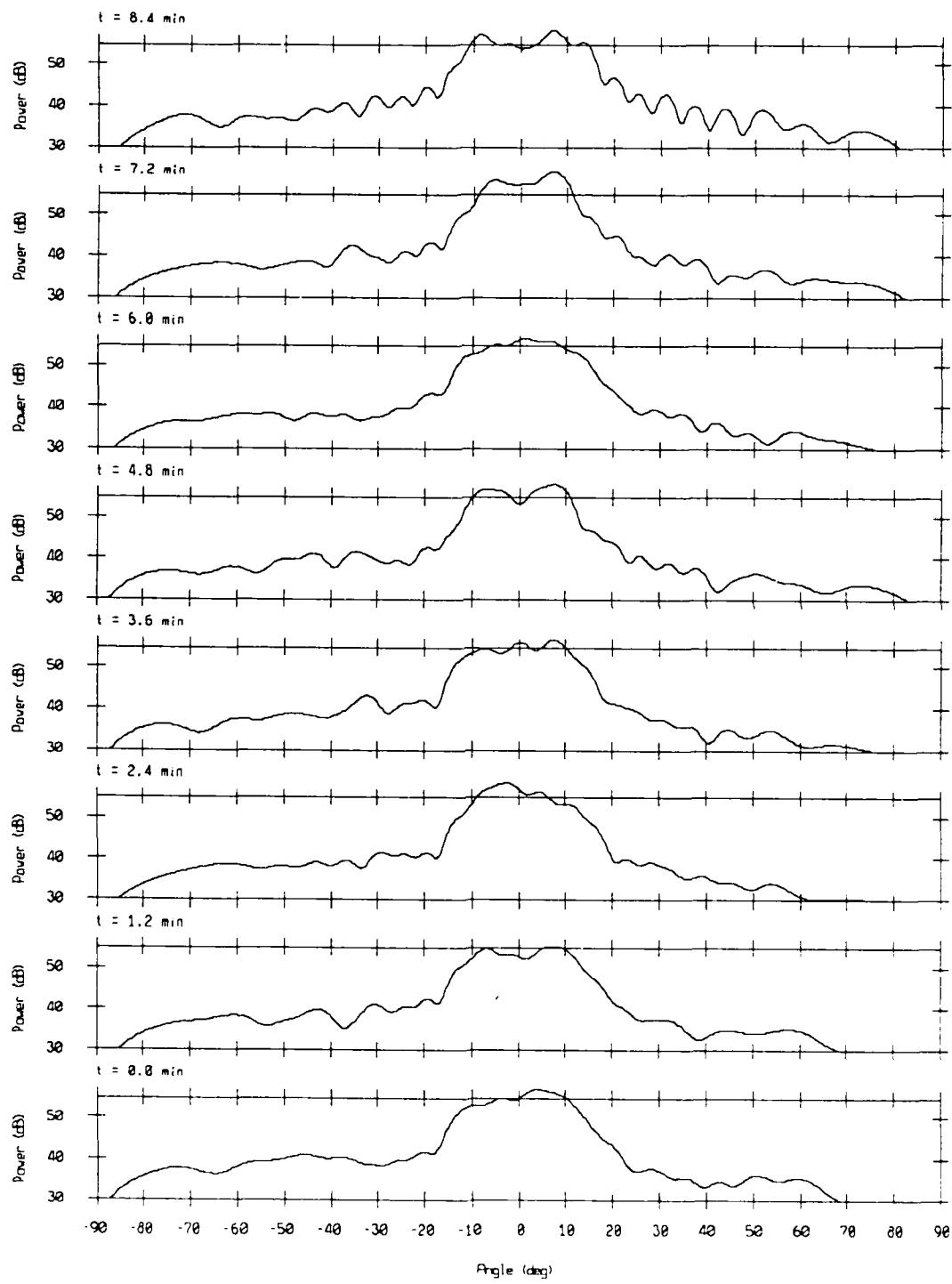


Array Response - 85010 Bin #5225
 $f = 125$ Hz, rect window



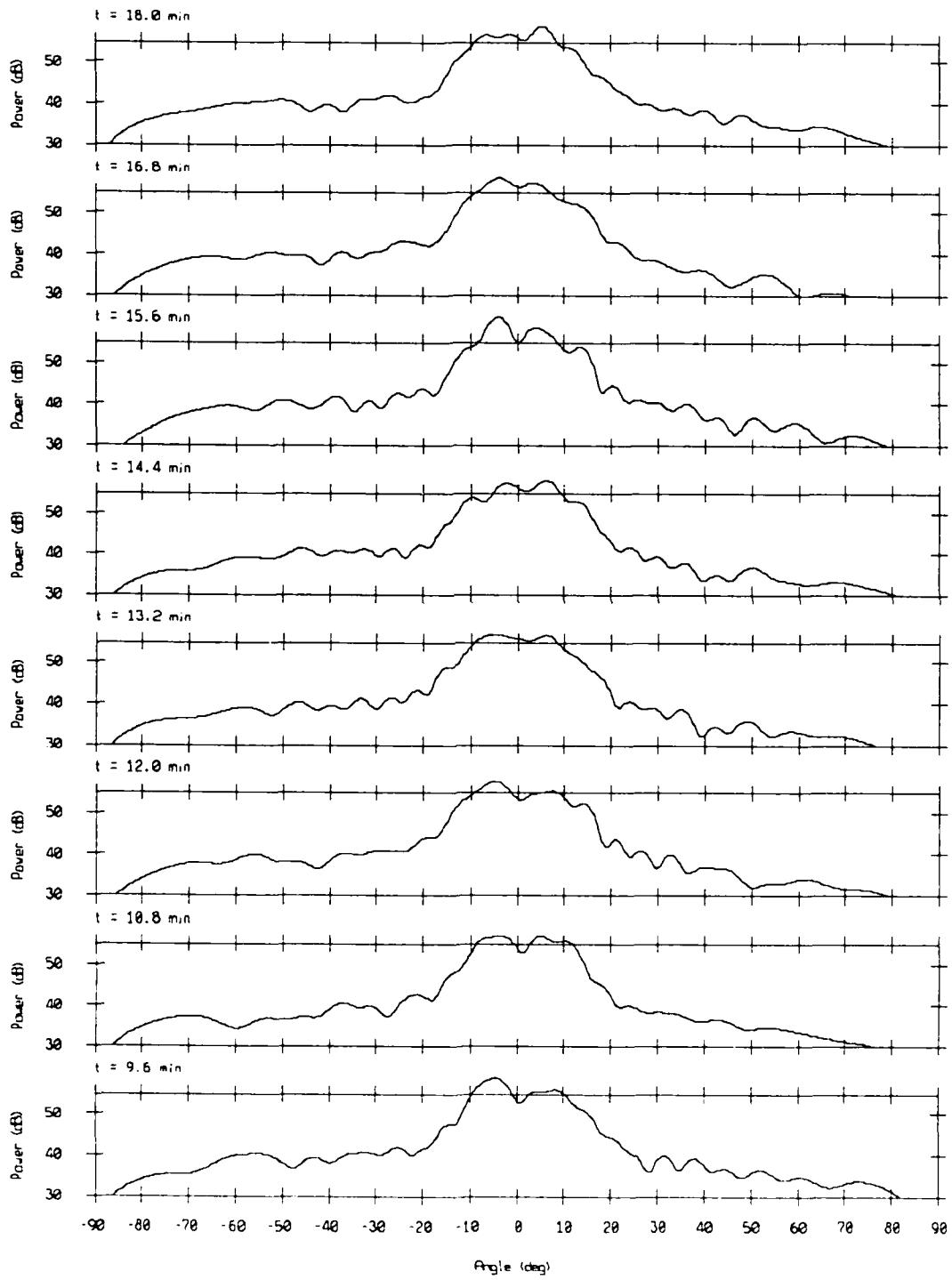
Array Response - 85010 Bin #5451

f = 150 Hz, rect window



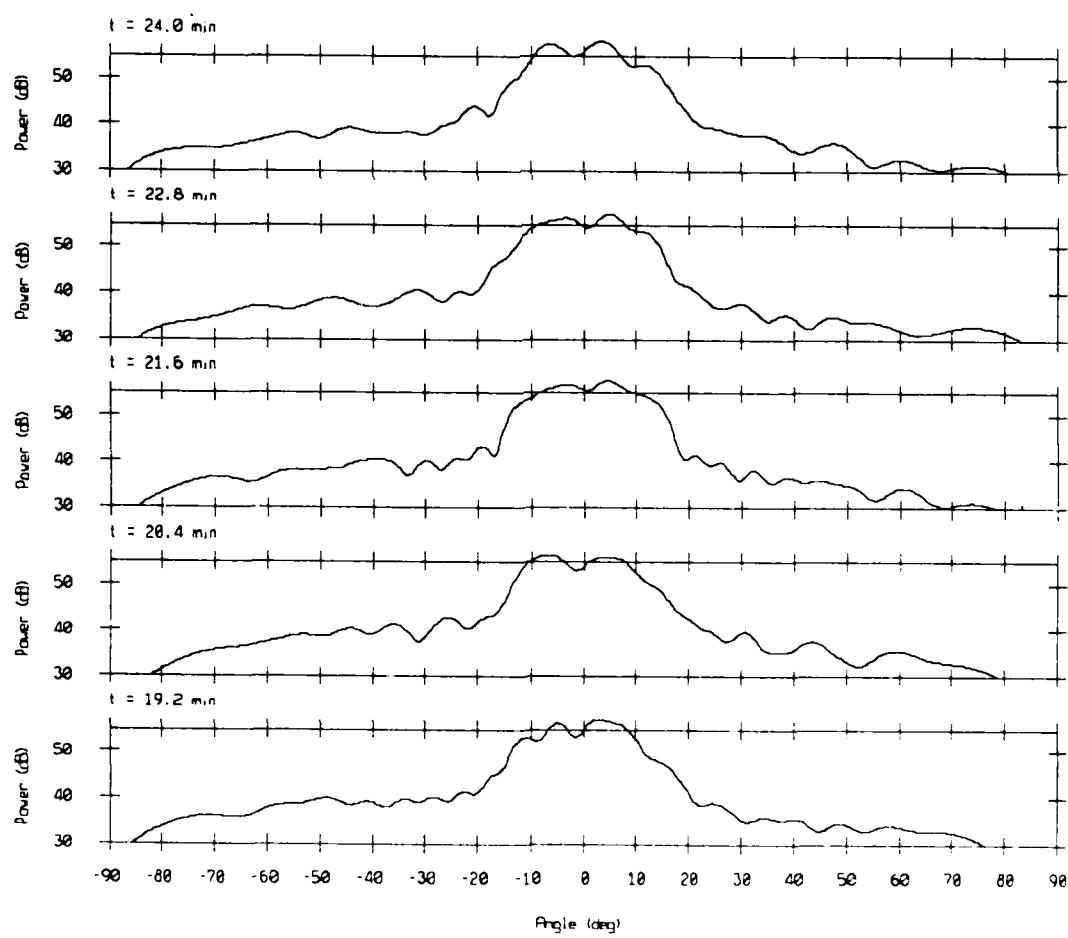
Array Response - 85010 Bin #5451

f = 150 Hz, rect window



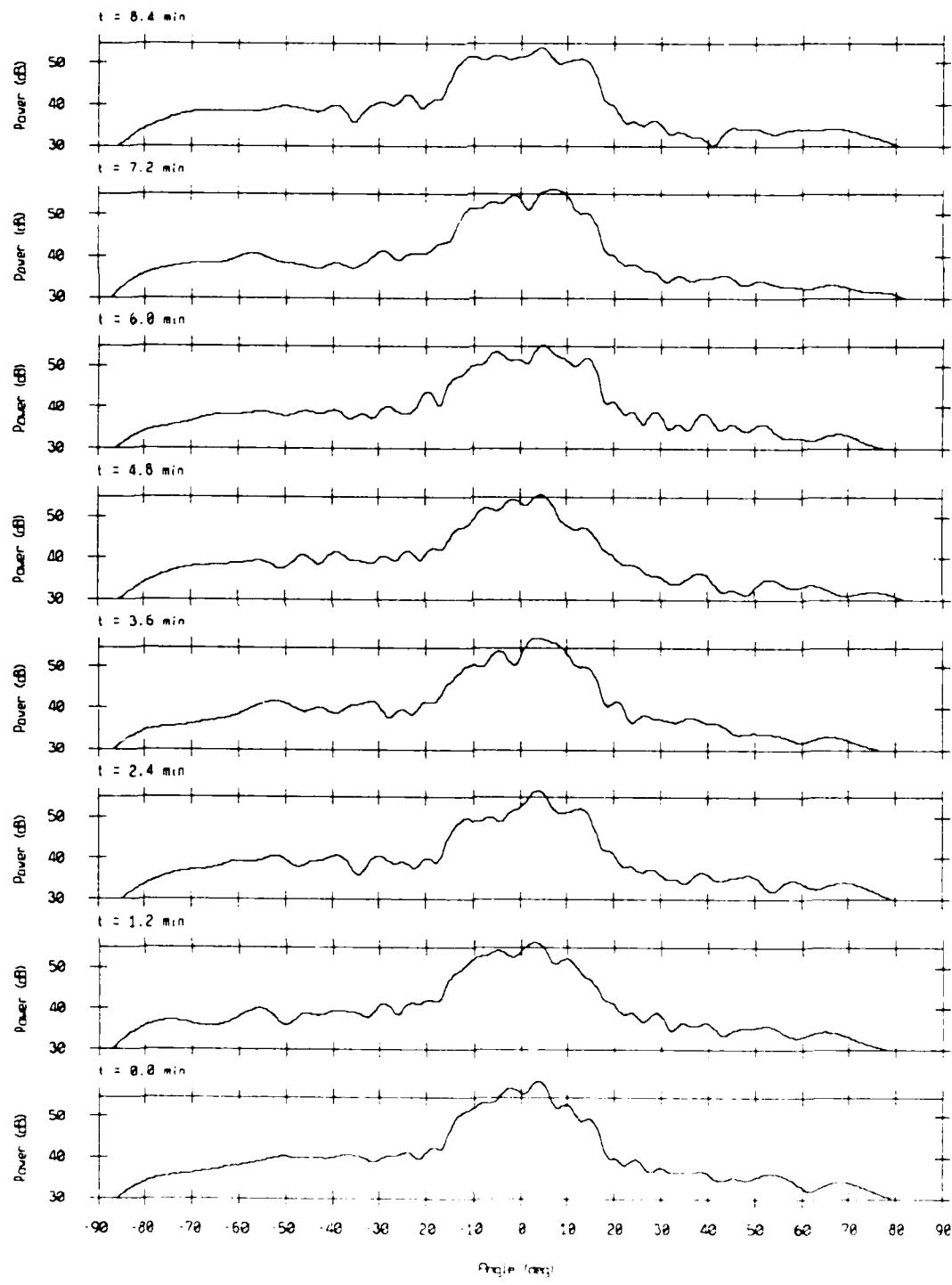
Array Response - 85010 Bin #5451

f = 150 Hz, rect window



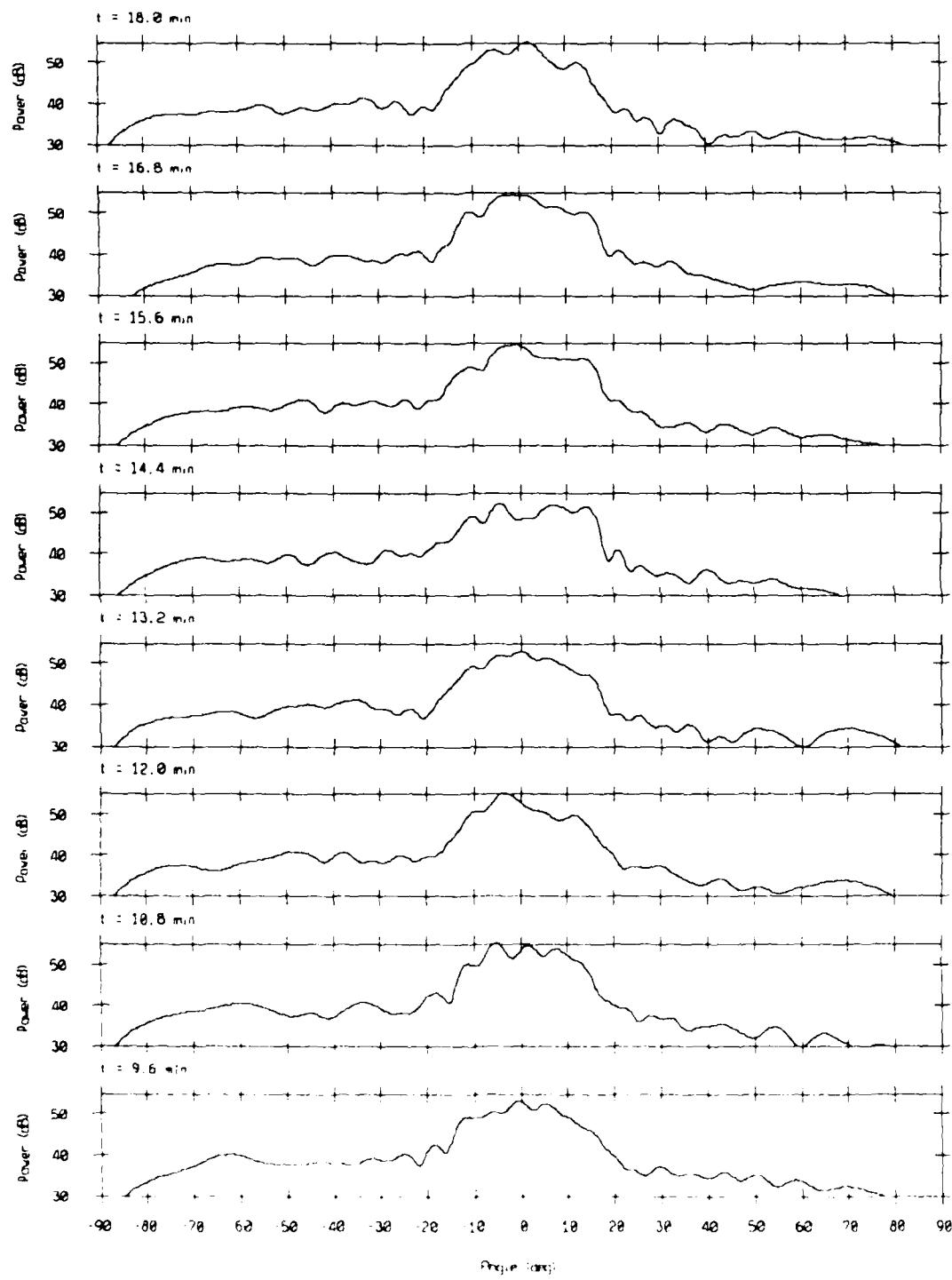
Array Response - 85010 Bin #5676

$f = 175$ Hz, rect window



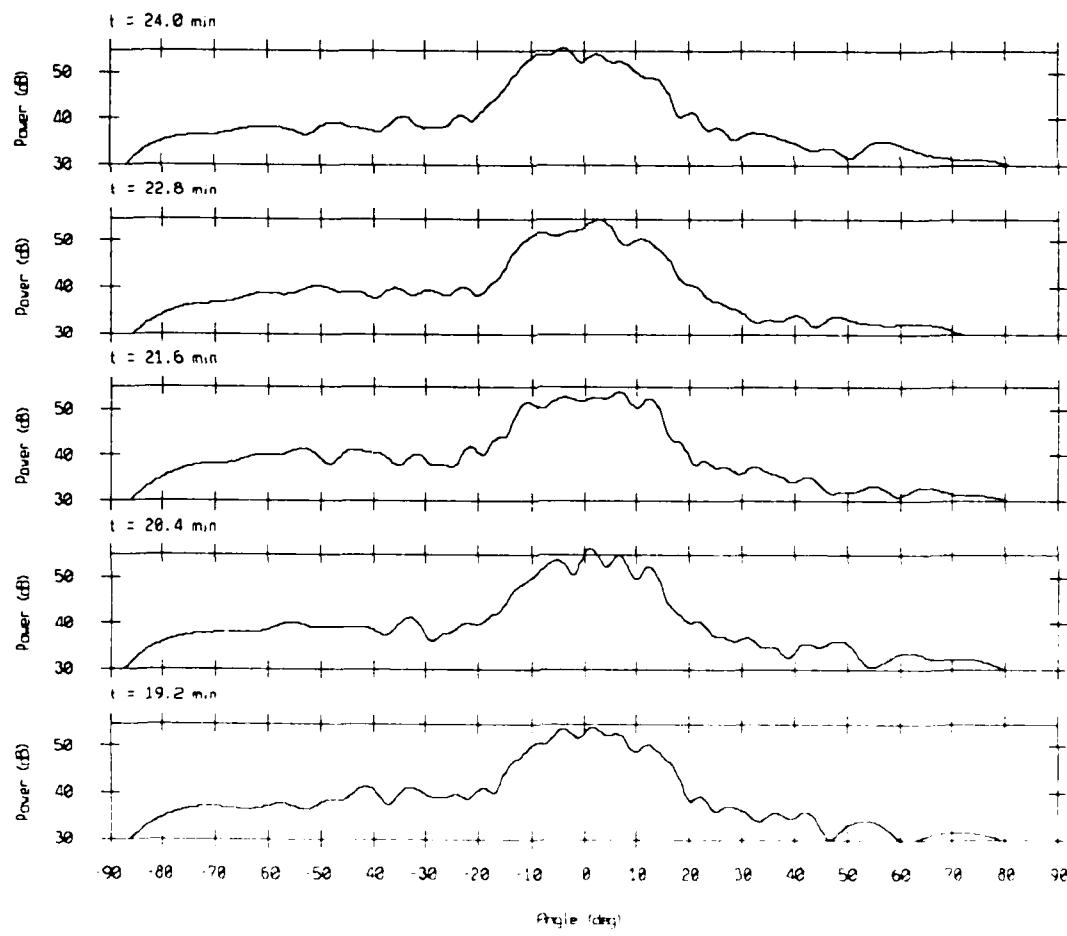
Array Response - 85010 Bin #5676

f = 175 Hz, rect window



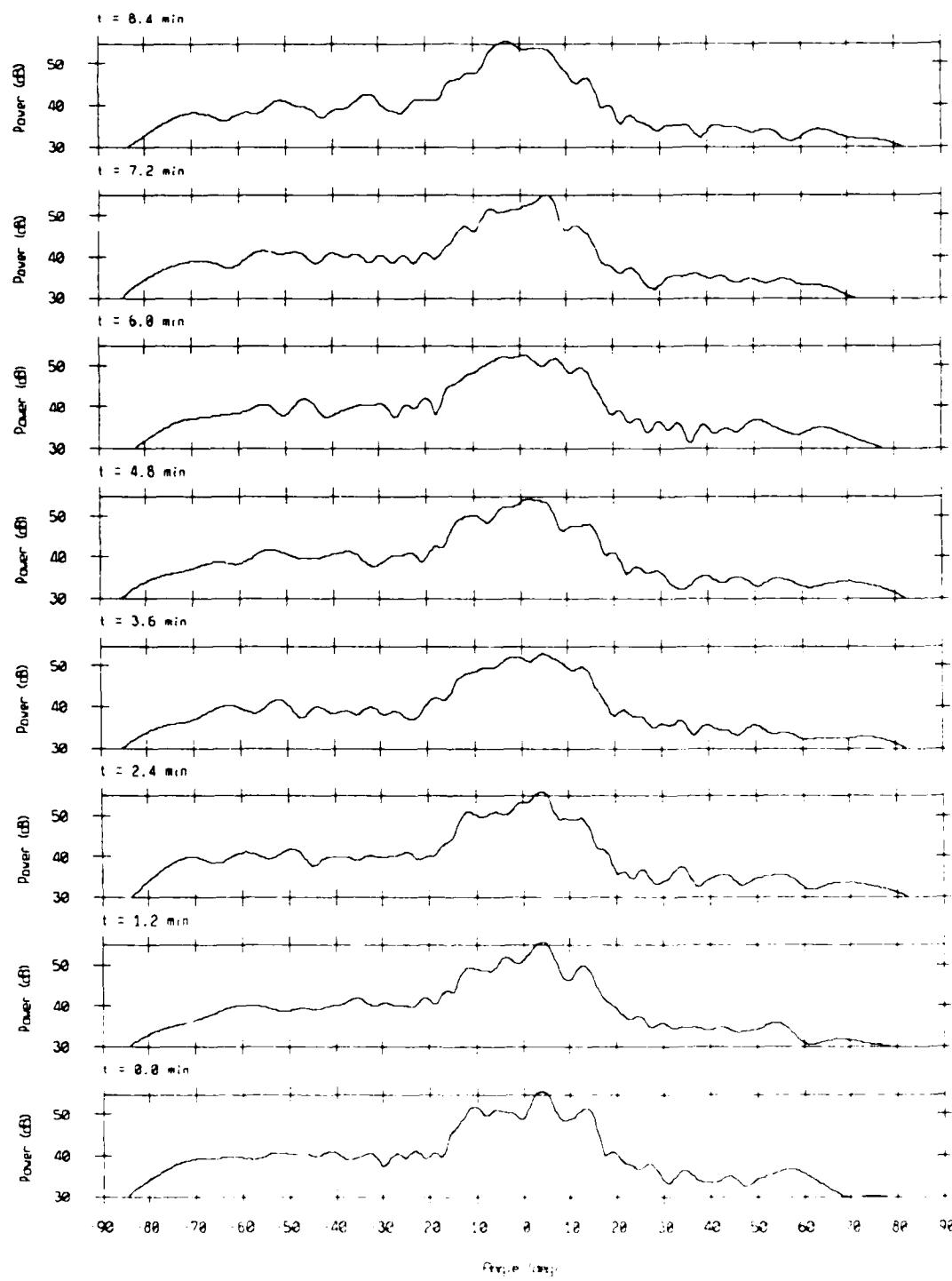
Array Response - 85010 Bin #5676

f = 175 Hz, rect window



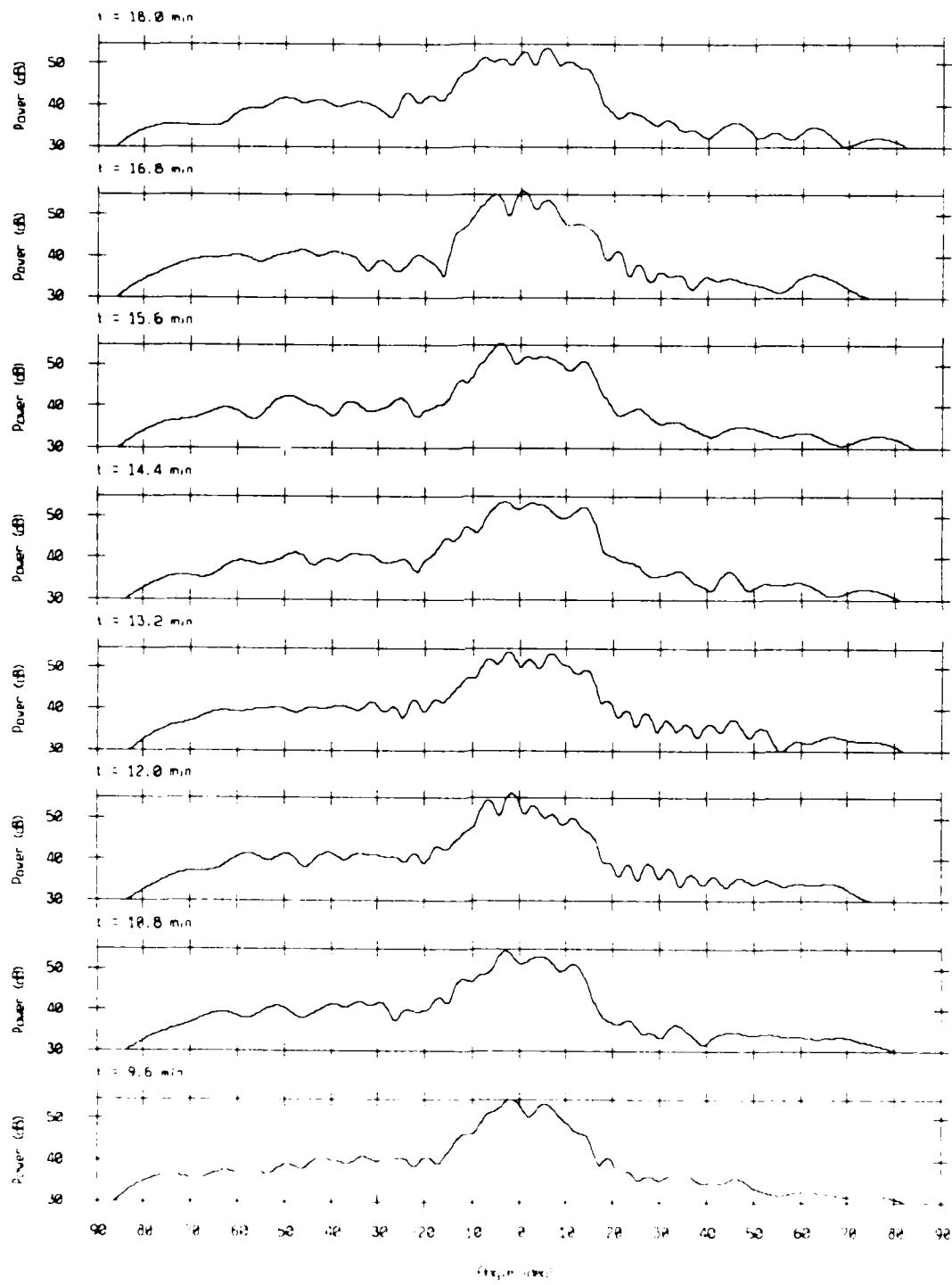
Array Response - 85010 Bin #5902

f = 200 Hz, rect window



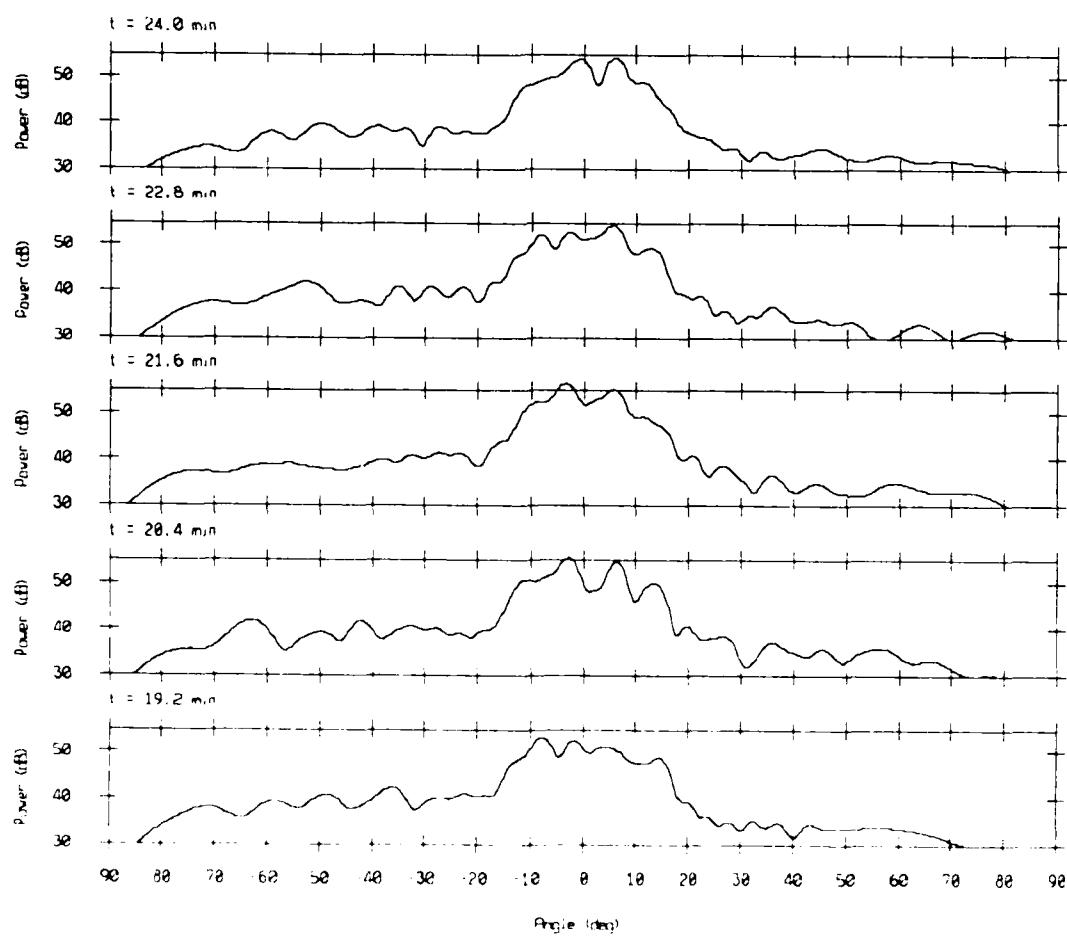
Array Response - 85010 Bin #5902

f = 200 Hz, rect window



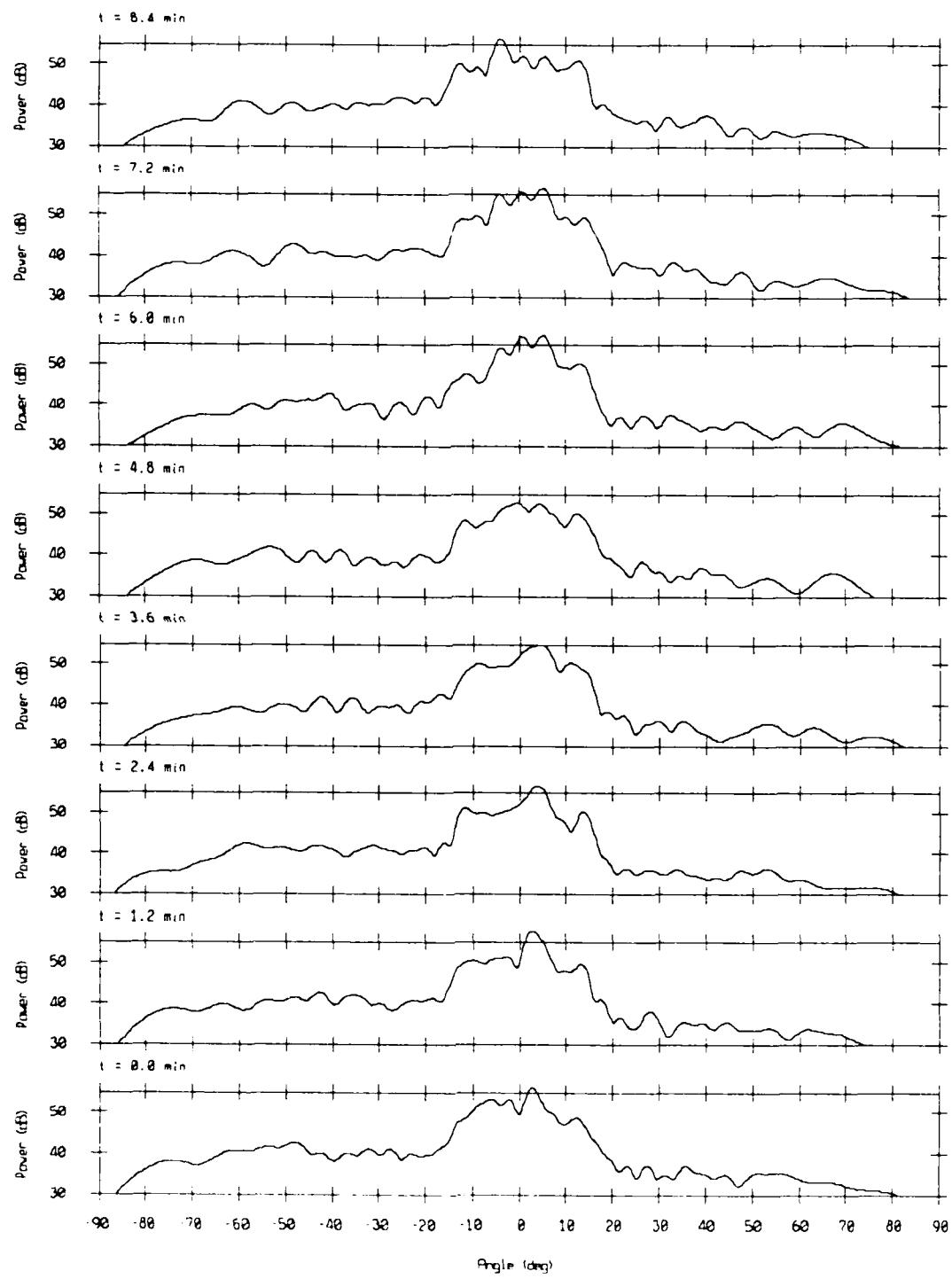
Array Response - 85010 Bin #5902

f = 200 Hz, rect window



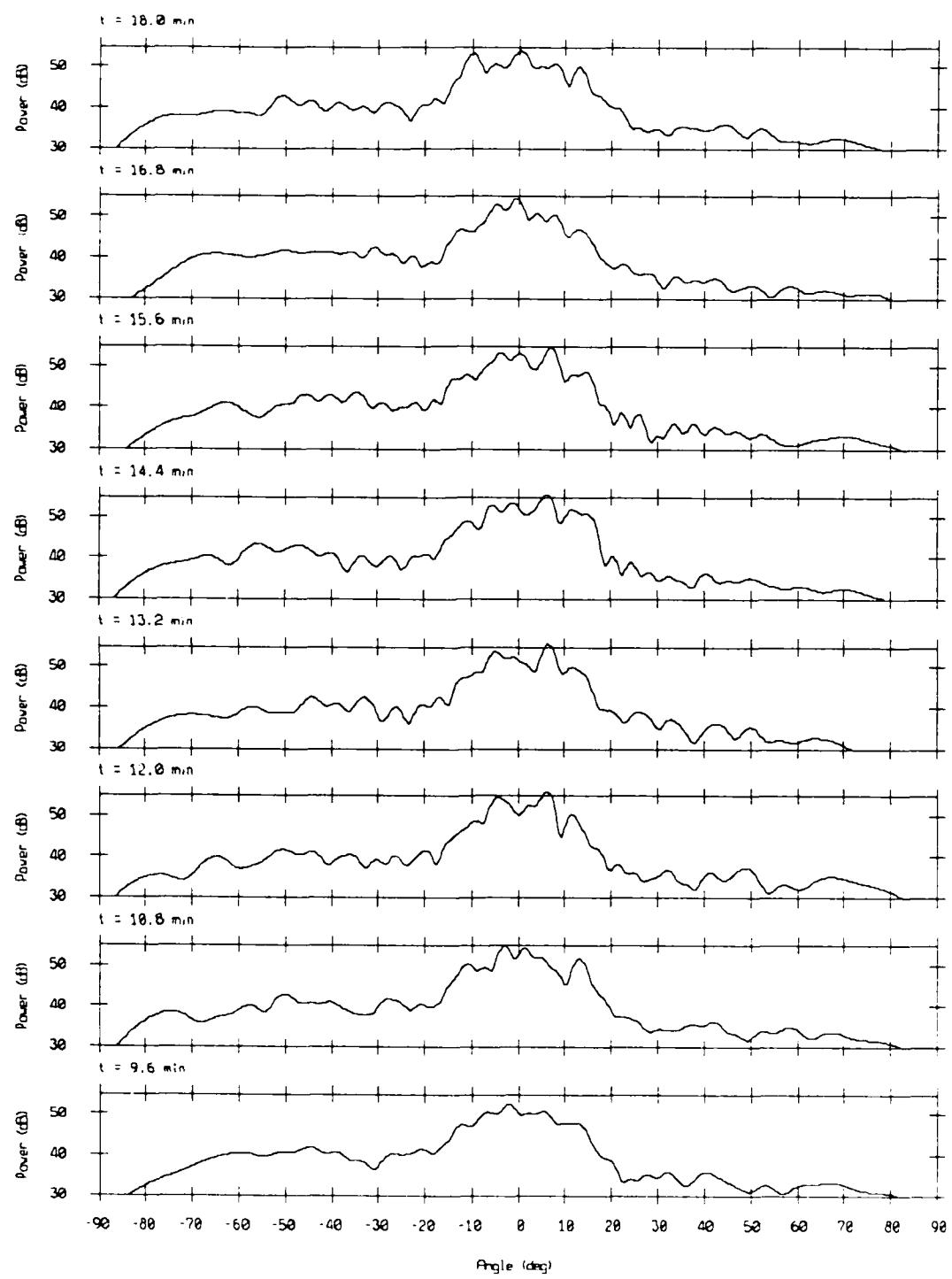
Array Response - 85010 Bin #6127

f = 225 Hz, rect window



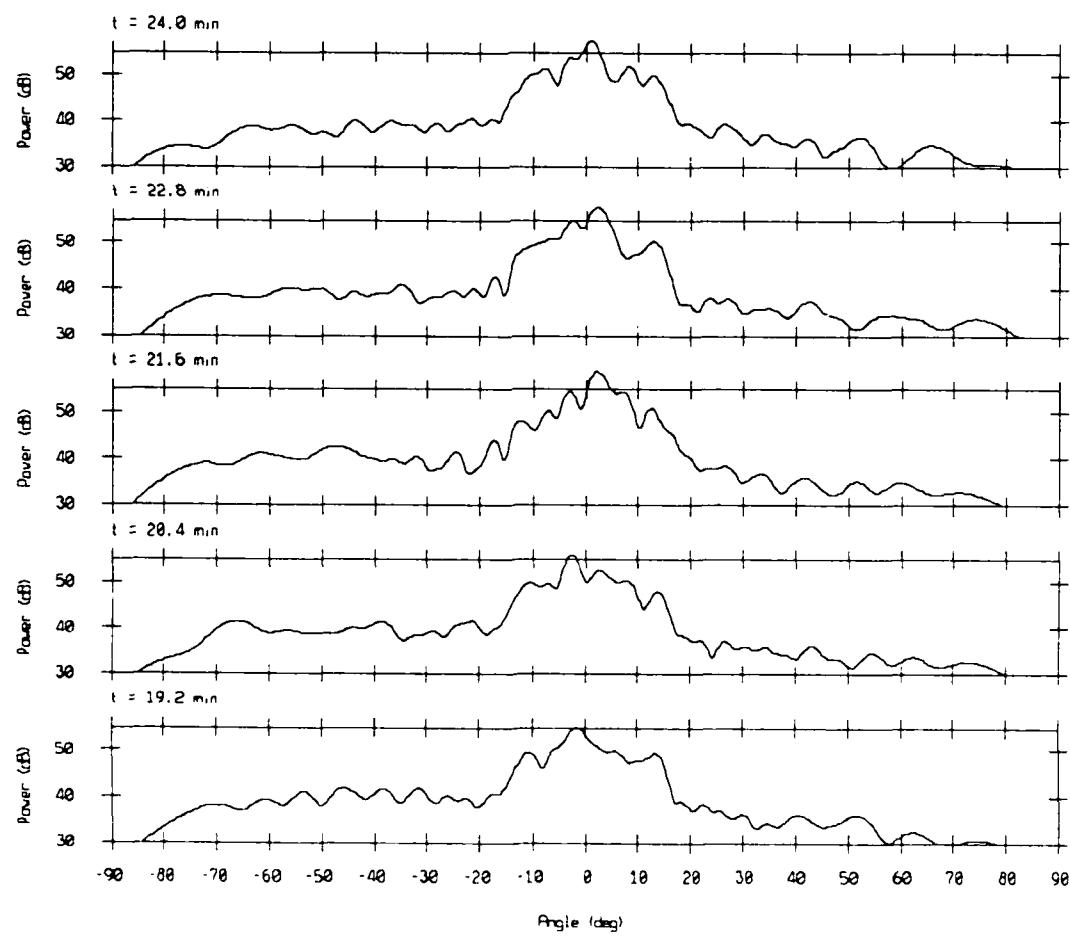
Array Response - 85010 Bin #6127

f = 225 Hz, rect window



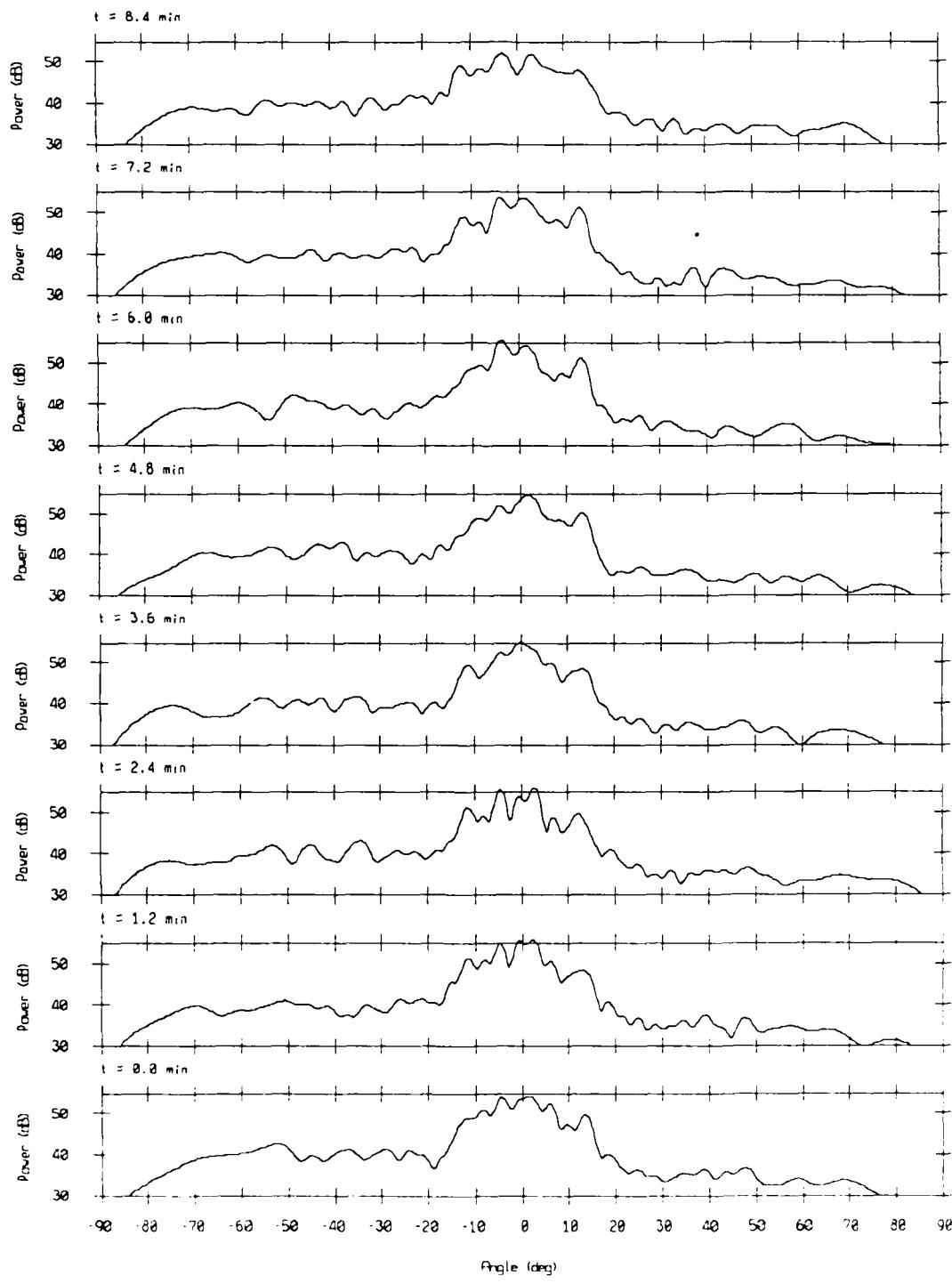
Array Response - 85010 Bin #6127

f = 225 Hz, rect window



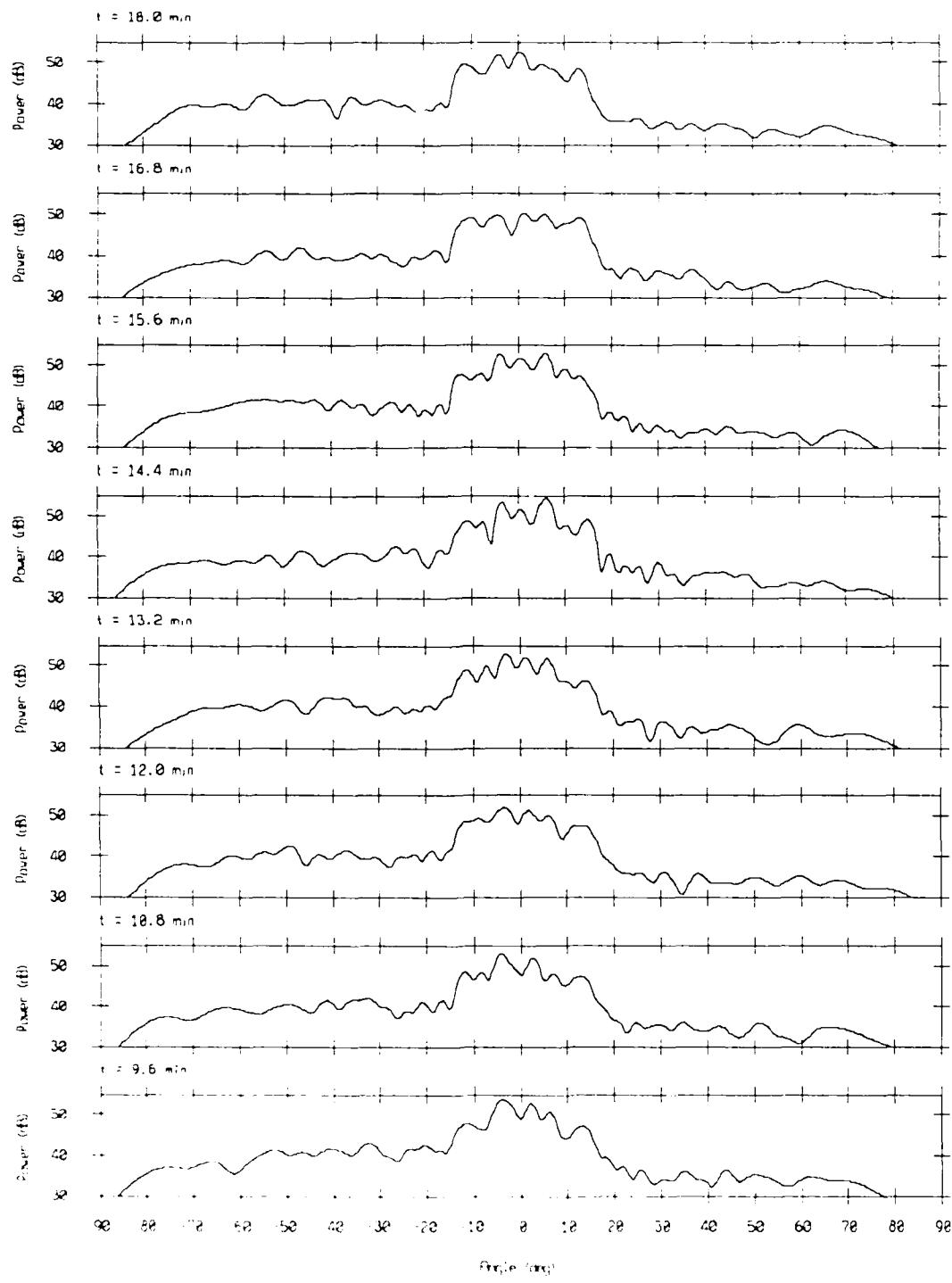
Array Response - 85010 Bin #6354

f = 250 Hz, rect window



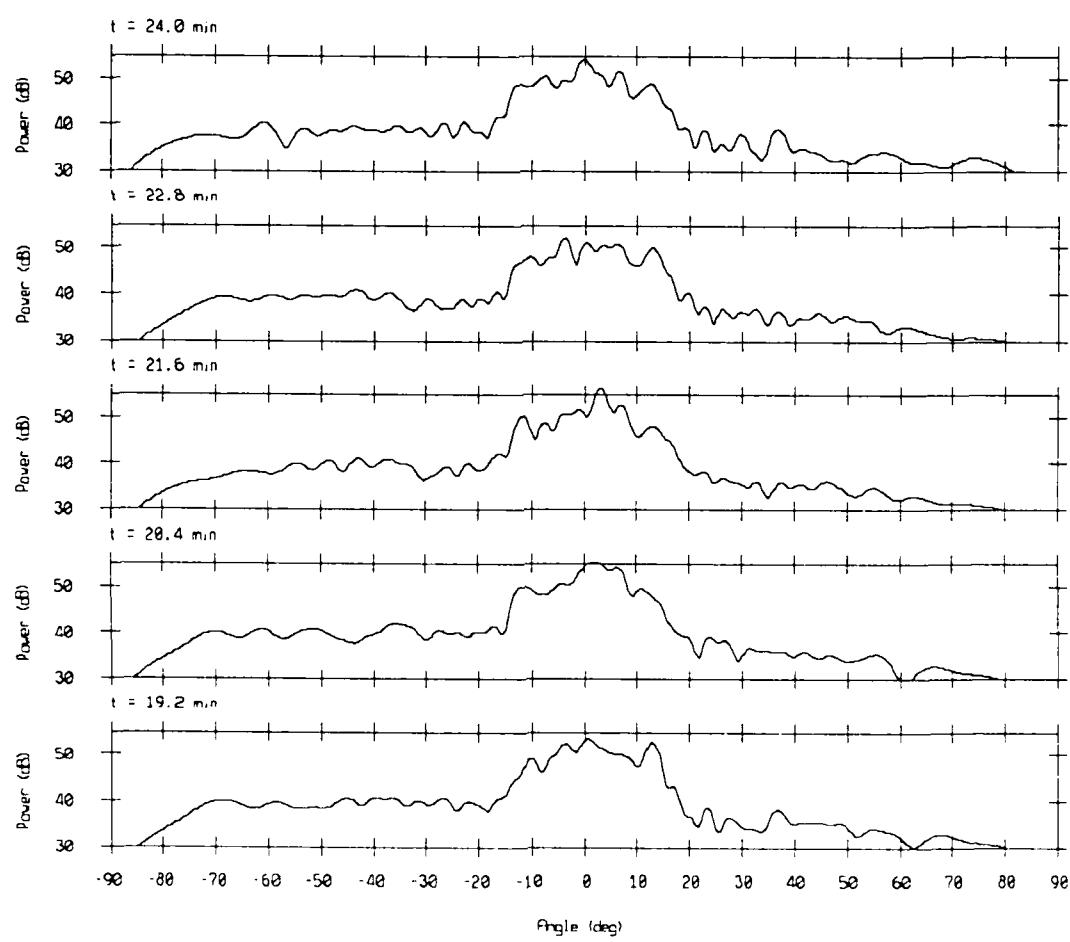
Array Response - 85010 Bin #6354

f = 250 Hz, rect window



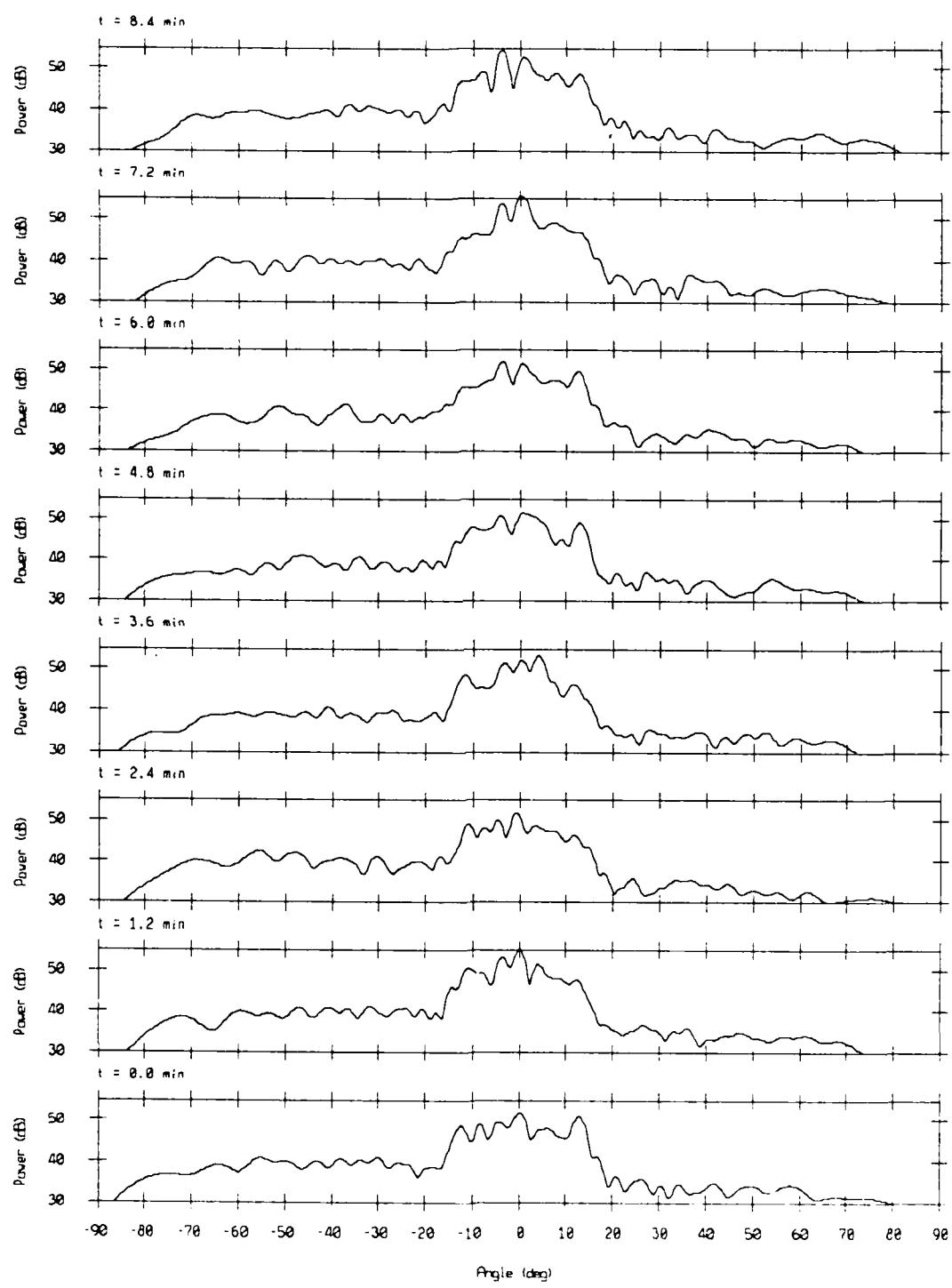
Array Response - 85010 Bin #6354

f = 250 Hz, rect window



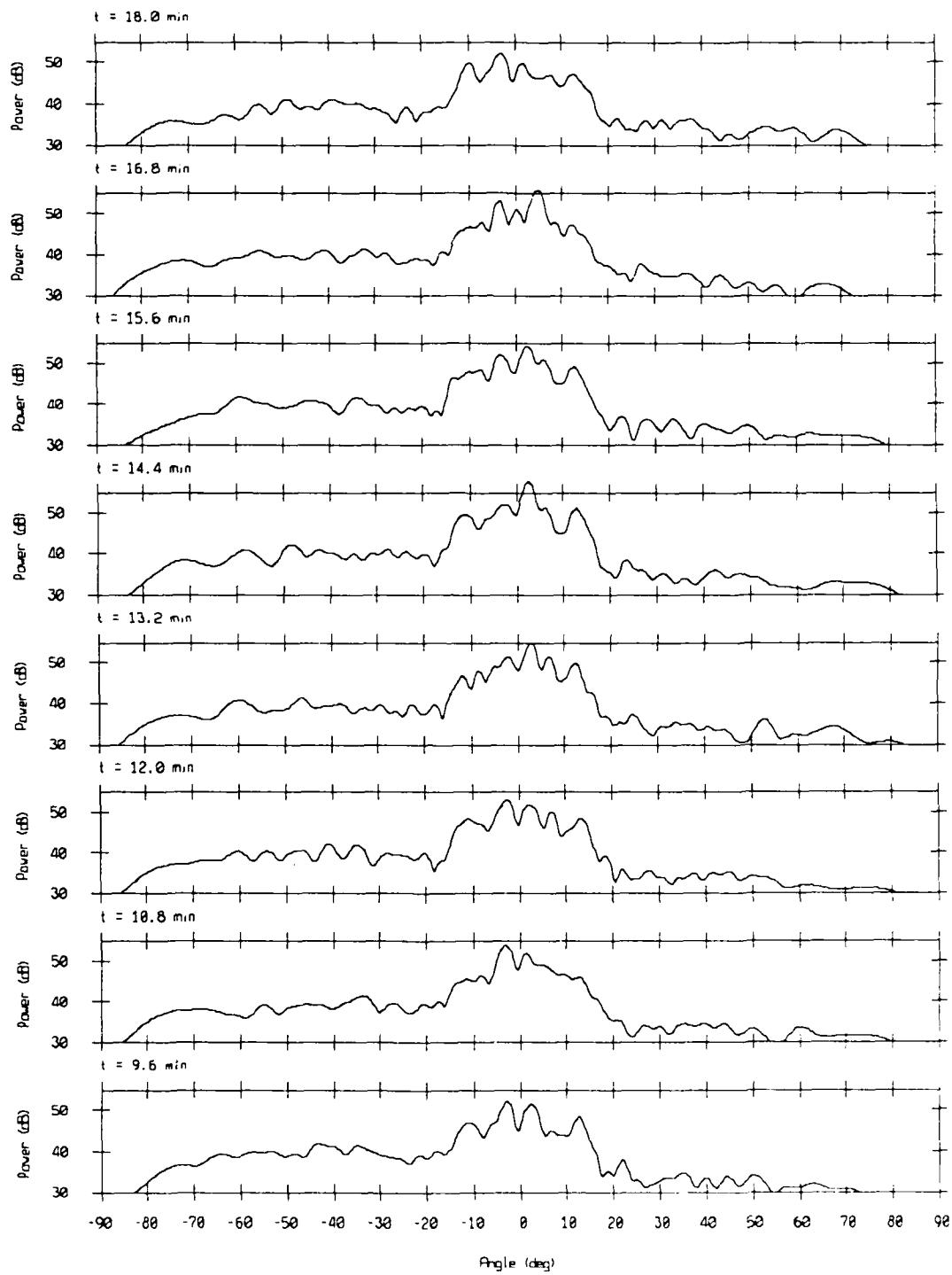
Array Response - 85010 Bin #6579

f = 275 Hz, rect window



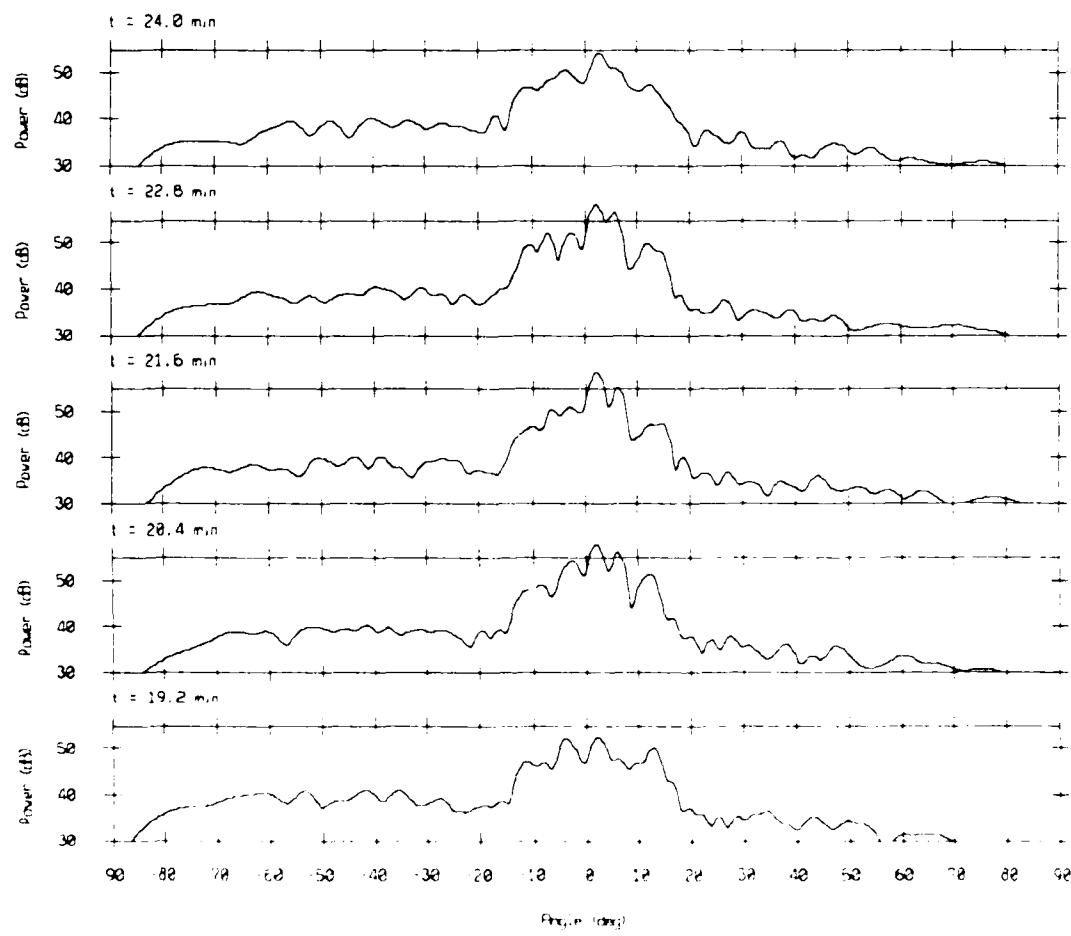
Array Response - 85010 Bin #6579

f = 275 Hz, rect window



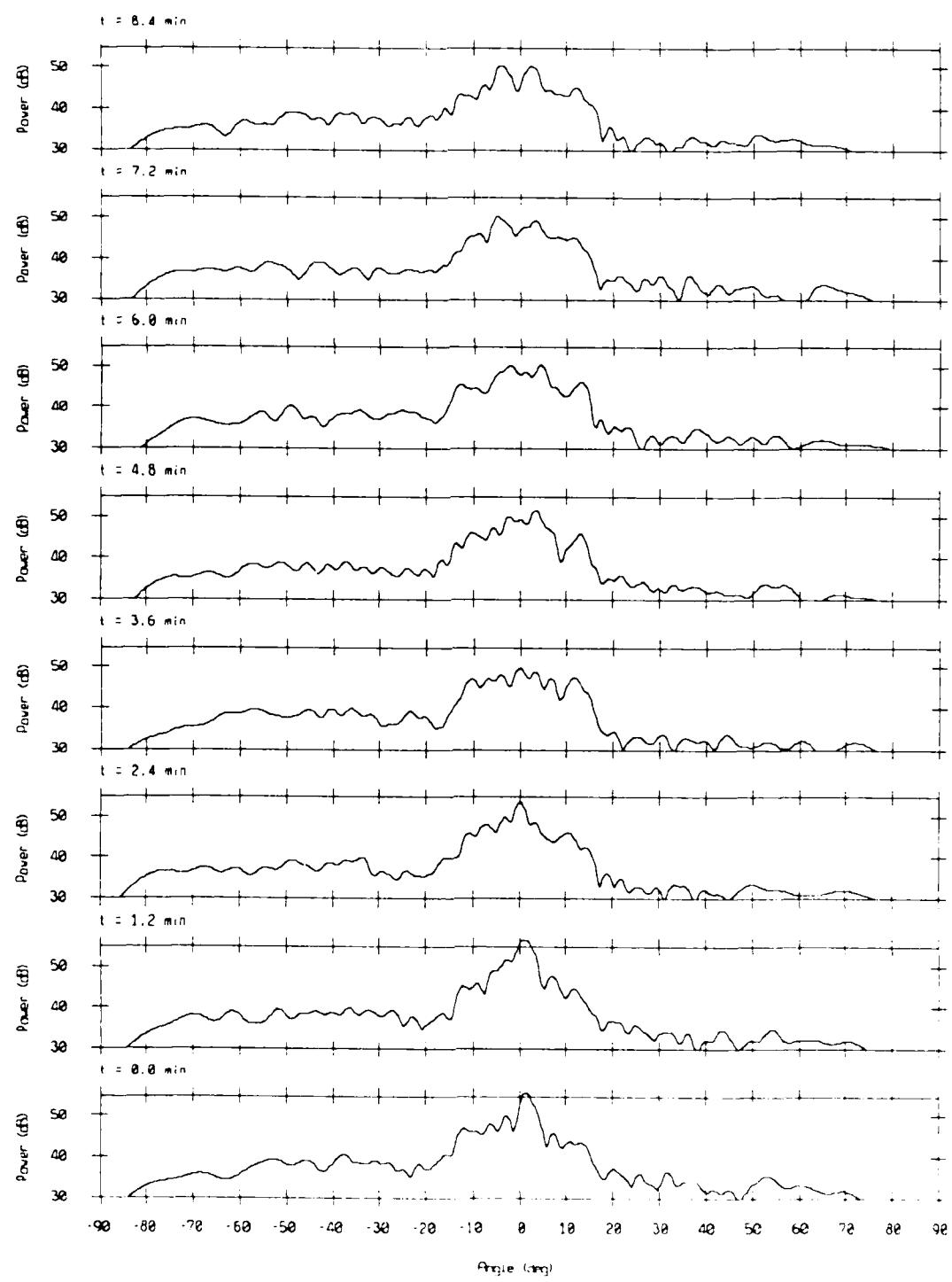
Array Response - 85012 Bin #6579

f = 275 Hz rect window



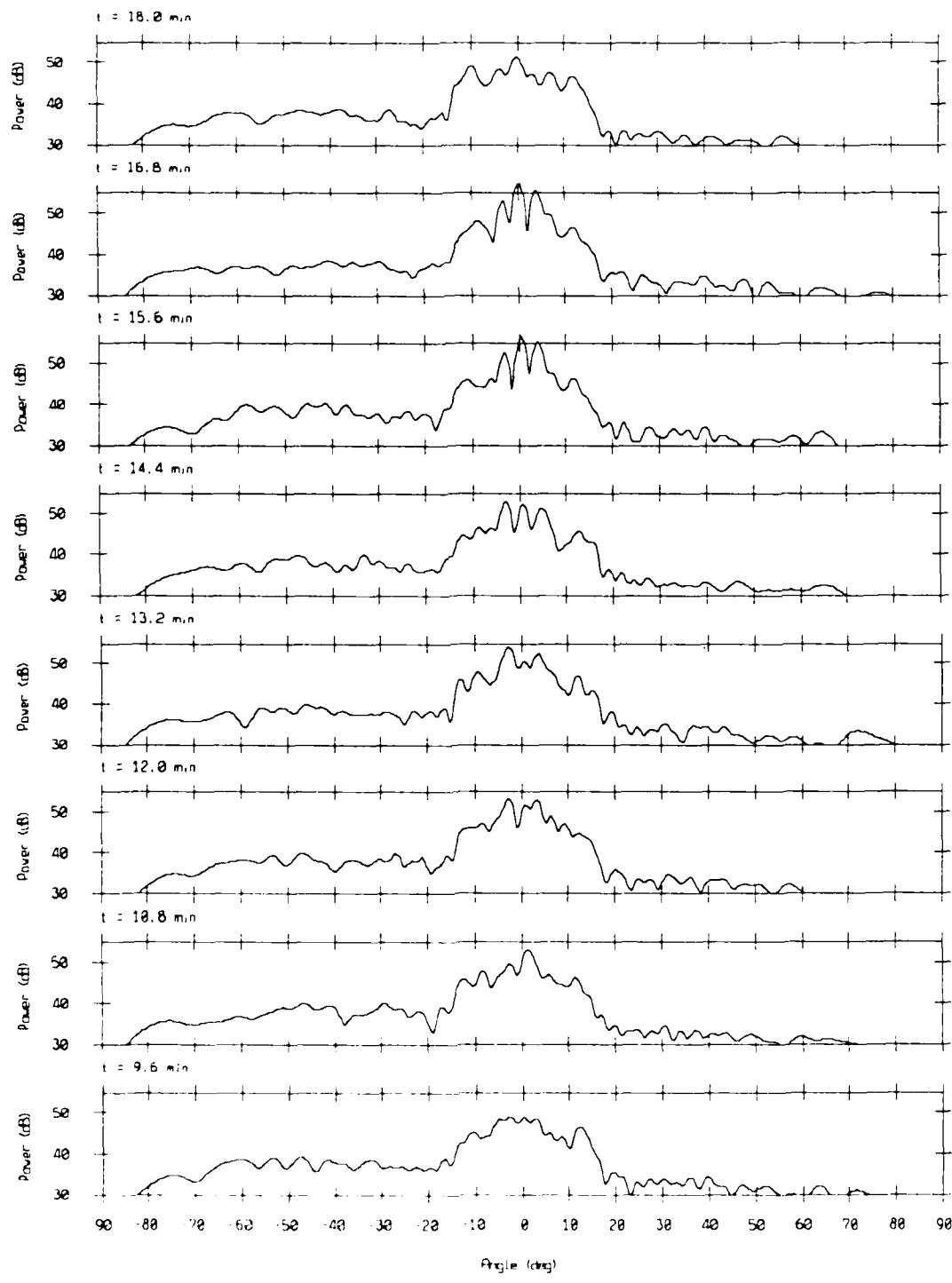
Airway Response - 85010 Bin #6824

f = 322 Hz, rect window



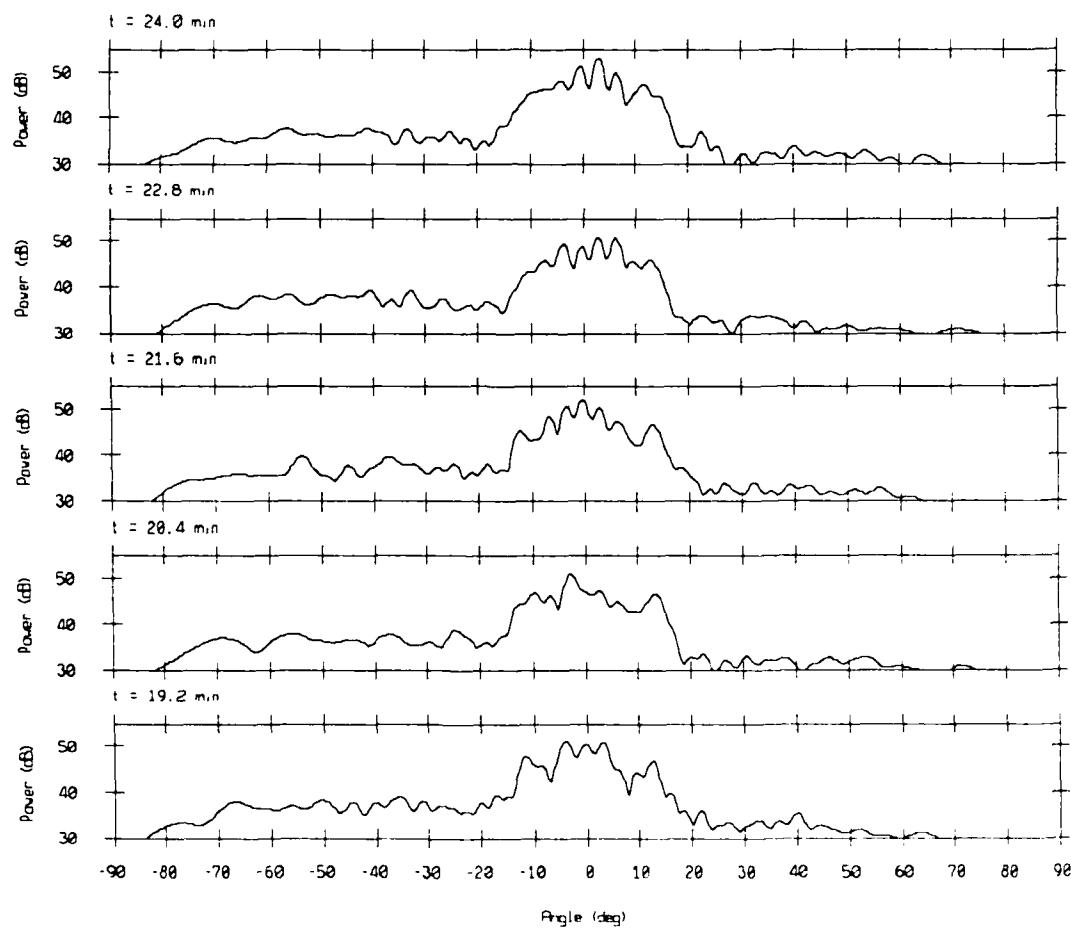
Array Response - 85010 Bin #6824

f = 300 Hz, rect window



Array Response - 85010 Bin #6804

f = 300 Hz, rect window



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